FIFTEENTH ANNUAL REPORT

OF THE

OREGON AGRICULTURAL COLLEGE

AND

EXPERIMENT STATION

FOR THE YEAR ENDING

JUNE 30, 1903.

AGRICULTURAL COLLEGE PRINTING OFFICE.
GEO. B. KEADY, PRINTER.
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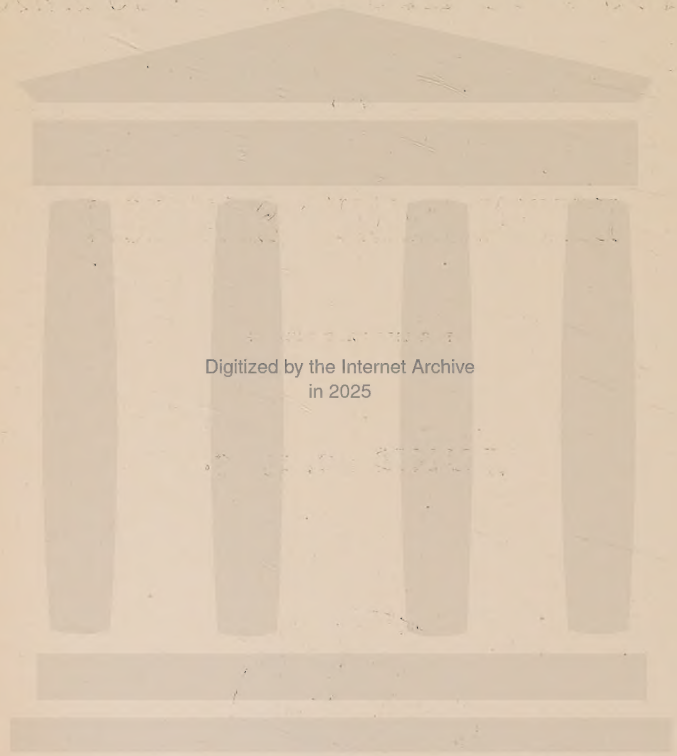

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FIFTEENTH ANNUAL REPORT

OF THE

OREGON AGRICULTURAL COLLEGE AND EXPERIMENT STATION.

REPORT OF THE PRESIDENT OF THE BOARD OF REGENTS.

Hon. George E. Chamberlain, Governor of the State of Oregon.

SIR:—Pursuant to an Act of the Legislative Assembly of 1885, as President of the Board of Regents of the State Agricultural College, I have the honor to report to you the condition of the College, financially and otherwise.

In 1866 the people of the State of Oregon, through Legislative Act, accepted of the provisions of an Act of Congress, approved on the 2nd day of July, 1862, granting public lands to the several states and territories which should provide colleges for the benefit of agriculture and the mechanic arts, and the acts amendatory thereof, and by said act permanently located said college at the city of Corvallis. That thereafter the Legislature of the State of Oregon passed general laws for the government of said college and provided for the creation of a Board of Regents to be denominated the Board of Regents of the State Agricultural College of the State of Oregon, who are, by said act, constituted a corporation for that purpose with full power to make contracts and to enact from time to time such by-laws and regulations as in their discretion shall seem necessary and proper for the benefit, development and successful management of the said College. And in said act it is, among other things, provided that the President of the Board shall, once a year, make a written report to the Governor setting forth the condition of the College, financially and otherwise.

For a detailed statement of the receipts and disbursements of the several funds received for the benefit of the College and Experimental Station, I call your attention to the itemized reports of the Secretary and Treasurer appended hereto and made a part of this report.

The greater portion of the funds for the maintenance of the College and Experimental Station is derived from three sources:

First:—From the State of Oregon, by and through the interest that accumulated on the irreducible fund, which fund is derived from the sale of land given to the State by Act of Congress, approved July 2nd, 1862, which act gives 30,000 acres of land for each senator and representative in Congress to which the State was entitled by the apportionment under the census of 1860. Oregon, having taken advantage of this act in 1866, secured 90,000 acres of land, a large portion of which has been sold and the money invested by the Board of School Land Commissioners of the State of Oregon. The interest arising from this investment is used for the benefit of the College. The amount received from this source varies from year to year. The amount received for the year ending June 30, 1903, was $8,689.98.

Second:—There is also received from the National Government under what is known as the Morrill Act, approved by the President August 30, 1890, $25,000.00.

Third:—There is also received from the general government under what is known as the Hatch Act, approved 1887, $15,000.00, making a total received from these sources, of $48,689.98.

The $25,000.00 received from the Morrill fund, can be applied only to instructions in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic sciences, with special reference to their application to the industries of life and facilities for such instruction.

The $15,000.00 from the Hatch Act is to be used solely in the maintenance of an experimental station and for experimental work. It adds nothing to the income of the College for educational purposes.

No part or portion of the monies derived from these three sources can be used for the purpose of providing buildings or for their improvement or for the plant.

It will be noticed by the attached reports that the money derived from these sources has been used in strict compliance with the law creating the fund.

It becomes the duty of the State under its enactments, to make provision for the plant, the grounds, the buildings, and the appliances necessary to carry on the work in the College and Experiment Station.

The appropriations made by the State the last session of the Legislature have been used for the purpose of providing suitable buildings, furniture and appliances to carry on the work contemplated by the Morrill and Hatch Acts, excepting the Eastern Oregon Experimental Station, located at Union, Union County, Oregon, which is maintained exclusively by the State for which there was appropriated by the Legislature in 1903, $20,000 for buildings, improvements and maintenance, which will be sufficient to carry on the work at this Station until the next meeting of the Legislature of the State.

It will be seen from the foregoing that a small part, if any, of the actual maintenance of the Agricultural College and Experiment Station is derived from taxation.

I am pleased to be able to report that the College and Experiment Station is in the most prosperous condition. The number in attendance during the past year is larger than any previous year and there has been a more general interest manifested by the public, more inquiries made of the various departments for information on subjects pertaining to agriculture, horticulture, etc., than at any prior period of its history.

The College Station is in closer touch with the people generally and is undoubtedly doing a work that is of inestimable benefit to the State of Oregon.

For a detailed statement of the work of the various departments, I call your attention to the report of the officers of the Board of Regents, the President of the College and the heads of the various departments of the College and Station accompanying this report and made a part hereof.

I have the honor, my dear sir, to remain,

Yours respectfully,

J. K. WEATHERFORD.

To the Honorable, the Board of Regents of the State Agricultural College of Oregon.

GENTLEMEN:—I have the honor to submit the following as a report of the work done at the State Agricultural College and Experiment Station during the year ending June 30th, 1903, together with a synopsis of the condition and situation of the properties under the control of the Board of Regents.

FINANCIAL STATEMENT.

BALANCES ON HAND JULY 1, 1902.

Improvement	$ 11.61	
Chemical Breakage	178.65	
Local Station	1.65	$ 191.91

INCOME FOR THE YEAR.

Station—Hatch	$15,000.00	
College—Morrill	25,000.00	
State Interest	8,689.98	
Improvement	561.35	
Chemical Breakage	834.60	
Local Station	1,443.99	
Special	40,277.19	$91,807.11
Total available funds		$91,999.02

DISBURSEMENTS.

Station	$15,000.00	
College	25,000.00	
State Interest	8,689 98	
Improvement	389.76	
Chemical Breakage	598.25	
Local Station	1,442.30	
Special	35,594.77	$86,715.06
Balance		$ 5,283.96

BALANCES BY FUNDS.

Improvement	$183.20	
Chemical Breakage	415.00	
Local Station	3.34	
Special	4,682.42	$5,283.96

The itemized statement of the financial condition will be found in the Treasurer's and Secretary's itemized reports of the receipts and expenditures of the various funds of the College and Experiment Station which are submitted by them to the Board for inspection.

BUILDINGS.

The various College buildings are in good condition and preservation. No changes have been made in the buildings at the College since the last report excepting the completion of the Agricultural Hall, which is fully completed and paid for, and is now in use by the Experiment Station staff. This building was appropriately dedicated to the uses and purposes for which it was designed, by public dedicatory services held therein on the 15th day of October, 1902, at which time a large number of prominent agriculturists and men who have distinguished themselves as leaders in the various industrial departments of the State were present and participating. The late Congressman Tongue delivered a very able and valuable address on the occasion which was published in the form of a bulletin and widely distributod over the State. It was a noticable feature of the occasion that the Board of Regents were highly

complimented by those in attendance upon their wisdom in erecting such a commodious building for the purposes of teaching agriculture and lifting this important but sometimes neglected industry to the social plane to which it is entitled in the affairs of men.

No other changes of moment have been made in the buildings or grounds at the College since the last report.

WATER SUPPLY.

I desire to call the attention of the Board to the fact that it is imperatively necessary to provide a larger supply of water for the College. The committee in charge of the buildings and grounds have discussed the feasibility of sinking to a greater depth the wells from which the present supply is obtained with the hope of securing a sufficient supply. It is thought that the supply may be materially increased in this manner with a small outlay. It would be well to move the power plant to connect it with the heating plant. By doing so a saving in fuel and labor could be effected amounting to probably $1,000 or more annually.

GROUNDS.

Athletic sports have become a part and parcel of the College, as they are of all institutions of learning, and to provide for proper grounds for drill purposes, athletic field, and field sports, it became necessary to secure a tract of land, which was done by leasing from Mr. E. E. Wilson of Corvallis at a nominal rent. It was done by the various athletic clubs of the College, with the acquiesence of the president and faculty. It would be the part of wisdom to secure suitable grounds for this purpose to be used for drill purposes and athletic exercises and field meets at as early a date as the Board feel that they can do so, without interfering with other improvements that are necessary.

IMPROVEMENTS.

There are many improvements that should be undertaken during the ensuing year, such as building new fences, extending the walks, repainting buildings, adding an addition to the girls dormitory, and other improvements that will readily suggest themselves to the Board.

During the past year the girls' dormitory has been inadequate to accommodate the numbers applying for admission, and it is confidently expected that a larger number will apply for accommoda-

tions in the dormitory the coming year. Hence it becomes necessary if we keep up the dormitory to enlarge it so as to meet the requirements of those desiring to take advantage of its facilities, or to discontinue it entirely, which should be considered by the Board at the present time.

EASTERN OREGON SUB-STATION.

The Station at Union is proving a success beyond our most sanguine expectations. The development of grasses is all that could be hoped for in the length of time the Station has been in operation, in fact some of the experiments in that line are more than successful.

The Oregon Brome, a new grass developed by Prof. Leckenby, is proving very satisfactory. Another new grass developod at this Station, and named the Evergreen, bids fair to rival anything that has yet been discovered or produced in the way of grass, and we are assured this grass can be made to grow successfully on the arid soil of Eastern Oregon. If so, it will repay to the state ten-fold all the expenses incurred in the maintenance of the Station.

A number of other new and useful grasses are being experimented with from which we hope to realize excellent results.

IMPROVEMENTS.

The last Legislature appropriated $20,000 for the improvement and maintenance of this Station and it has been thought advisable to use a part of this fund for the purpose of building fences, making ditches, and erecting barns to be used at the Station for the purpose of feeding and taking care of cattle, sheep and hogs and experimenting with the various classes of grains, grasses and other food in the development of beef, pork and mutton.

A contract has been let to Mr. J. L. Slater to erect a suitable and commodious barn for this purpose at and for the sum of $6,970.00 It is to be completed in the early fall and we trust will be in time to store away a portion of the crop of hay and grain produced on the farm by the Station force.

LITIGATION.

We are experiencing some difficulty with the Hutchinson Brothers, who own large tracts of land joining the Station farm. It originated out of an irrigating ditch that passes over the experimental farm lands to the lands of the Hutchinson Brothers. We

had some trouble last year with these gentlemen but thought that we had settled the same to the satisfaction of all parties concerned. However, without any apparent reason therefor the Hutchinson Brothers undertook to enlarge their ditch and to dam up the natural waterway that flows over our lands in such a manner as to force the water out over quite a large portion of our lands and to sub-irrigate another large portion of it the effect of which is to prevent the use of nearly all the grounds that have been set apart for experimental purposes, and would, if continued, destroy this year's crop. An injunction suit was commenced in the name of the Board and Mr. Leckenby, in charge of the Station, in the Circuit Court of Union County, Oregon, enjoining the Hutchinson Brothers from interfering with the natural waterways and from enlarging their ditch and from forcing the water back in such a manner as to injure our lands. This suit is now pending in the Circuit Court and will be heard some time in the near future. From the facts as reported I feel confident that we will be able to maintain our position. If not, we will at least have determined by a decree of the Court what our rights are in the premises and what we may expect in the future. But if the contention of the Hutchinson Brothers should be sustained and a decree rendered in their favor, the Station lands will be rendered of little value for anything excepting wild grasses and it will be an irreparable injury to the Station lands. I feel as though some action should be taken by the Board in reference to this important matter at its present session.

CONDITION OF THE SCHOOL.

The general condition of the College is such as to deserve commendation from the Board of Regents. The President of the College, with the assistance of his able corps of professors, have done good work the past year, so much so as to commend this school to the people of the state and to attract the attention of those desiring to take a practical College course. This has been noticeable by the increase in attendance. The enrollment one year ago was 480; during the present year it has reached 541 and it is confidently expected that the enrollment during the coming year will reach 650.

GOVERNMENT OF THE COLLEGE.

By a solemn act of the Legislature of the State of Oregon the government of this College was vested in this Board of Regents who

are given absolute power to make contracts and to enact from time to time and to vary and amend all such by-laws and regulations as in their discretion may seem necessary and proper for the benefit, development and successful working of the College; to prescribe courses of instruction and studies in compliance with the objects sought by the Acts of Congress in the establishment of Agricultural Colleges and by the Acts of the Legislative Assembly of the State of Oregon, to-wit: Instruction in agriculture and mechanical arts.

How well you have done this work can only be answered by the large increase in the attendance and by the unanimous commendation of the people of the state.

Thanking you for the confidence reposed in me, I am,

Respectfully yours,
J. K. WEATHERFORD.

TREASURER'S REPORT.

CORVALLIS, OREGON, July 15, 1903.

To the Honorable the Board of Regents, Oregon Agricultural College:—

GENTLEMEN:—Herewith I submit my report for the year ending June 30, 1903. The vouchers and other evidences of payment are on file in the office of the Clerk and Purchasing Agent.

Very respectfully,

B. F. IRVINE, Treasurer.

BALANCE ON HAND JULY 1, 1902.

Improvement	11.61	
Chemical Breakage	178.65	
Local Station	1.65	$ 191.91

INCOME FOR THE YEAR.

Station—Hatch	$15,000.00	
College—Morrill	25,000.00	
State Interest	8,689.98	
Improvement	561.35	
Chemical Breakage	834.60	
Local Station	1,443.99	
Special	40,277.19	$91,807.11
Total available funds		$91,999.02

DISBURSEMENTS.

Station	$15,000.00	
College	25,000.00	
State Interest	8,689.98	
Improvement	389.76	
Chemical Breakage	598.25	
Local Station	1,442.30	
Special	35,594.77	$86,715.06
Balance		$ 5,283.96

BALANCES BY FUNDS.

Improvement	$ 183.20	
Chemical Breakage	415.00	
Local Station	3.34	
Special	4,682.42	$ 5283.96

MISCELLANEOUS RECEIPTS AND THEIR DISTRIBUTION.

Source.	Amount.	Local Station.	Improvement.
Agriculture	$ 928.51	$ 928.51	
Dairy	429.68	429.68	
Horticulture	46 35	46.35	
Miscellaneous	600.80	39.45	$561.35
Totals	$2,005.34	$1,443.99	$ 561.35

DISBURSEMENTS BY SALARIES, INCIDENTALS, TOTALS.

DEPARTMENT OR ITEM.	SALARIES.	INCIDENTALS.	TOTALS.
Printing	$ 1,600.00	$ 651.03	$ 2,251 03
Agriculture	3,080.00	2,676.33	5,756.33
Horticulture	1,080.00	2,647.10	3 727.10
Botany	1,600.00	78.49	1,678.49
Chemistry	4,724.00	1,162.82	5,886.82
Chemical Breakage		598.25	598.25
Bacteriology	1,460.00	73.52	1,533.52
Entomology	2,600.00	152.42	2,752.42
Mechanics	4,220.00	791.67	5,011.67
Household Economy	1,560.00	71.92	1,631.92
Military	120.00	34.46	154.46
Library	366.75	447.33	814.08
Drawing	720.00	----	720.00
Salaries outside departments	17,270.00	----	17,270.00
Sanitary		233.00	233.00
Furniture		44.19	44.19
Traveling expenses		940.68	940.68
Advertising		107.25	107.25
Fuel		2,038.61	2,038.61
Insurance		1,388.00	1,388 00
Postage		348.37	348.37
Freight		448.63	448.63
Telephones and telegrams		123.00	123.00
Scientific apparatus		85.35	85.35
Tools and machinery		383.33	383.33
Building repairs—general		468.56	468.56
Building, repairs—Station		12.80	12.80
Miscellaneous labor		951.47	951.47
Miscellaneous supplies		336.18	336.18
Cauthorn Hall		412.82	412.82
Alpha Hall		50.00	50.00
Miscellaneous and current		1,652.08	1,652.08
Agricultural Hall—New		26,842.25	26,842.25
Live Stock		62.40	62.40
Totals	$40,400.75	$46,314.31	$86,715.06

TREASURER'S ACCOUNT—FACE OF LEDGER.

FUND.	DR.	CR.	BALANCES.
Station	$15,000.00	$15,000.00	$---- ----
College	25,000.00	25,000.00	---- ----
State Interest	8,689.98	8,689.98	---- ----
Improvement	572.96	389.76	183.20
Chemical Breakage	1,013.25	598.25	415.00
Local Station	1,445.64	1,442.30	3.34
Special	40,277.19	35,594.77	4,682.42
Totals	$91,999.02	$86,715.06	$ 5,283.96

REPORT OF THE FINANCE COMMITTEE.

CORVALLIS, OREGON, July 15, 1903

To the Board of Regents:—

GENTLEMEN:—We your Finance Committee would respectfully report that we have examined the books and vouchers in the office of the Clerk and Purchasing Agent of the College and Station and we find the same well kept, neat and correct.

We have checked up all the drafts and compared them with the original receipted bills on file, and we have found them correct as set forth in the report and books of the Clerk.

We have examined the report of the Treasurer of the Board for the year ending June 30, 1903, and find it correct as to the amount of money to be accounted for, and the receipts and disbursements are found to be correct and agree with the books and vouchers on file in the office of the College and Station.

We find the expenditures for the College and Station for the past year, in the aggregate, have exceeded our estimates of income, but owing to a liberal appropriation from the State Legislature, we have been enabled to meet all claims and have a small balance on hand at the close of the fiscal year.

Respectfully submitted,

J. T. APPERSON,
W. E. YATES,
B. G. LEEDY,
Finance Committee.

FINANCIAL ACCOUNT.

Oregon Agricultural Experiment Station, in account with the United States Appropriation, 1902–1903.

DR.

To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1903, as per act of Congress approved March 2, 1887		$15,000.00

CR

By Salaries	$10,599.25	
Labor	2,006.06	
Publications	93.32	
Postage and stationery	117.37	
Freight and express	172.99	
Heat, light, water, and power		
Chemical supplies	610.78	
Seeds, plants, and sundry supplies	336.07	
Fertilizers	11.00	
Feeding stuffs	362.87	
Library	75.16	
Tools, implements, and machinery	229.05	
Furniture and fixtures		
Scientific apparatus	37.50	
Live stock	32.40	
Traveling expenses	252.38	
Contingent expenses	21.00	
Buildings and repairs	12.80	
		$15,000.00

We, the undersigned, duly appointed Auditors of the Corporation, do hereby certify that we have examined the books and accounts of the Oregon Agricultural Experiment Station for the fiscal year ended June 30, 1903; that we have found the same well kept and classified as above, and that the receipts for the year from the Treasurer of the United States are shown to have been $15,000.00, and the corresponding disbursements $15,000.00; for all of which proper vouchers are on file and have been by us examined and found correct.

And we further certify that the expenditures have been solely for the purposes set forth in the act of Congress approved March 2, 1887. Signed:

J. T. APPERSON,
B. G. LEEDY,
W. E. YATES,
} Auditors.

SUPPLEMENTARY REPORT.

LOCAL STATION FUND.

Balance on hand July 1, 1902	$ 1.65	
Received from sales of farm products, etc.	1,443.99	
		$ 1,445.64

DISBURSEMENTS.

Labor	$ 898.48	
Freight and express	1.75	
Feeding stuffs	104.35	
Library	12.65	
Tools, implements, and machinery	32.00	
Traveling expenses	111.50	
Contingent expenses	281.57	
		$ 1,442.30
Balance		$ 3.34

REPORT OF THE PRESIDENT.

To the Honorable Board of Regents of the Oregon Agricultural College and Experiment Station:—

GENTLEMEN:—I beg leave to introduce my report for the year ending June 30, 1903, with a transcript of a part of my report for the same period rendered to the Secretary of the Interior and the Secretary of Agriculture as required by law. This gives in systematic form considerable information which may be of interest to the Board:

STATE AGRICULTURAL COLLEGE OF OREGON

CORVALLIS, OREGON, June 30, 1903.

Report of the President of said institution to the Secretary of the Interior and the Secretary of Agriculture, as required by act of Congress of August 30, 1890, in aid of Colleges of Agriculture and Mechanic Arts.

I. Condition and Progress of the Institution for the year ended June 30, 1903, especially—

(1) Changes in course or methods of instruction if of sufficient importance to warrant mention, and (2) purpose, structural character, and cost of new buildings or addition to buildings.

(1). No radical changes have been made in the Course of Study.

(2). The Agricultural Hall mentioned in the report of a year ago has been completed at a total cost of $44,762.25. It will be fully occupied at the beginning of the fall term, September, 1903.

II. Value of Additions to Equipment during the year ended June 30, 1903.

(a) Permanent endowment	$
(b) Buildings	26,842.25
(c) Library	447.33
(d) Apparatus	100.00
(e) Machinery	383.33
(f) Live stock	62.40
Total	$27,835.31

III. Farmers' Institutes during the year ended June 30, 1903.

1. Number of institutes held in the State	20
2. Total attendance	3,750
3. Number of institutes attended by college and station staffs	20
4. Number of different members of the staffs engaged in the work	4
5. Amount of time in days given to institute work by college and station staffs	240
6. State appropriation for institutes for year ended June 30, 1903	None

IV. Nature Study.

What is being done by your institution to introduce nature study into the public schools of your State?

It is the intention of the College to issue from time to time leaflets on Nature Study to be placed in the hands of all the teachers in the public schools of the State.

Two leaflets have been issued, No. 1—A chat about seeds. No. 2—The story of the air we breathe. No. 3—On birds is in the course of preparation. These leaflets were introduced by a preliminary talk on "Nature Study in the Public Schools"—sent to each teacher in the State. Members of the Faculty lecture on this subject before Teachers' Institutes and other bodies during the year.

V. Receipts for and during the year ended June 30, 1903.

1. State aid.	(a) Income from endowment granted by State, balance on hand, July, 1902	$191.91
	(b) Appropriation for current expenses	13,434.94
	(c) Appropriation for building or for other special purposes	26,842.25
2. Federal aid.	(a) Income from land grant, act of July 2, 1862	8,689.98
	(b) Additional endowment, act of August 30, 1890	25,000.00
3. Fees and all other sources.	(a) Incidental fees	834.60
	(b) Miscellaneous receipts	2,005.34
4. Total		$76,999.02
5. Federal appropriation for experiment station, act of March 2, 1887		15,000.00

VI. Property, year ended June 30, 1903.

Value of all buildings, $160,000; of apparatus, $3,500; of machinery, $17,000; Total number of acres in farm and grounds, 198.91; acres under cultivation, 109; acres used for experiments, 50; value of farm and grounds, $25,000; number of acres of land allotted to State under act of July 2, 1862, 90,000; amount of land-grant fund of July 2, 1862, $131,556.37. Number of bound volumes in library, June 30, 1903, 3,300.

VII. Professors and Instructors during the year ended June 30, 1903.

1. College of Agriculture and Mechanic Arts:	MALES.	FEMALES.
(a) Preparatory classes or schools taught by College staff	--	--
(b) Collegiate and special classes	24	6
(c) Total, counting none twice	24	6

VIII. Students during the year ended June 30, 1903.

1. College of Agriculture and Mechanic Arts:	MALES.	FEMALES
(a) Preparatory classes or schools	41	13
(b) Collegiate classes	296	109
(c) Post graduate courses	9	3
(d) Short or special courses	27	43
Total, counting none twice	373	168

2. Number of college students in regular four year courses of study in agriculture, 70; mechanical engineering, 110; electrical engineering, 11; mining engineering, 19; household economy, 76; pharmacy, 53.
3. Number of students in short or special courses in dairying, 20.
4. Number of students in military drill, 372.
5. How many students graduated from undergraduate college courses during the year ended June 30, 1903: Men, 11; women, 18.
6. Average age of students graduated from undergraduate college courses during year ended June 30, 1903: 20.
7. What degrees and how many of each kind were conferred during year ended June 30, 1903: On men, Bachelors of Science, 11.
   On women, Bachelors of Science, 18.
8. What and how many honorary degrees were conferred during year ended June 30, 1903? None.

ATTENDANCE.

In the foregoing transcript the total attendance is noted as 373 men and 168 women, 541 in all. This makes an increase of 53 over last year's enrollment.

MILITARY DEPARTMENT.

In May I received notice from the War Department that Captain C. B. Hardin, of the 18th Infantry, had been detailed to act as our Instructor in Military Science. On May 19th, Captain Hardin reported for duty. The time was unfavorable for a change of commandants as it was within a month of the close of the year but we thought it best to conform to what appeared to be the wishes of the Department at Washington.

Captain Hardin has filled a similar position in another college, and having become a veteran in the service of his country he, doubtless, possesses the skill and knowledge demanded by the duties of his professorship.

On taking command he expressed himself as highly pleased with the organization and discipline of the battalion.

MUSIC.

This department has been fairly well sustained without expense to the College but the instruction has been limited to instrumental music. We are in great need of a competent teacher of vocal music.

Mr. Ruthyn Turney has consented to give instruction on the violin. Mr. Turney is an accomplished musician and a successful director of bands and orchestras.

MINES AND MINING.

I recommend that the building immediately south of the Administration building, heretofore used as a chemical laboratory, be fitted up for the mining department and be placed in charge of Professor John Fulton. During the past year Professor Fulton has been pursuing advanced studies in this line of work at Harvard University. During his absence Professor H. D. Gibbs has filled the chair to the satisfaction, I believe, of all concerned. Professor Gibbs is a graduate of Cornell and is well versed in chemistry and geology. I respectfully recommend that he be elected to a position in our Faculty as there will be a demand for assistance in chemistry and mining.

OTHER ASSISTANCE.

If the attendance increases next year as it has for each of the four preceding years, farther help will be demanded in Mathematics and English.

THE HALLS.

Both Halls have been well sustained during the year, ninety-seven students having been accommodated in Cauthorn Hall and twenty-five in Alpha Hall. For three years, now, these Halls have been conducted without expense to the College. I doubt whether this can be asserted of any preceding year in their history. Certain repairs, however, should now be made. The heating plant of Cauthorn Hall, especially demands attention. Three fire-escapes have been placed on Alpha Hall. Still, from thirty stoves, many

of them in charge of young ladies inexperienced in such matters, the danger from fire is very great. If there is no ground for hope that this building may soon be replaced by a better one, I earnestly recommend that our heating system be extended so as to include Alpha Hall.

PHYSICAL CULTURE.

Under the skillful management of the Assistant Professor of Mathematics athletics for the past year were a pronounced success. The proceeds of the incidental fee established at the last annual meeting were, I believe, judiciously expended. They were paid out principally for athletics on requisitions of the manager. Every dollar was expended in a way that I knew would meet the approval of the students who had so cheerfully contributed to the fund.

The incidental fees were collected as follows:

First term	$447.00
Second term	430 00
Third term	347.00
Total	$1,224.00

I have not heard a single objection on the part of any of the students to the payment of this fee. Indeed, they would sincerely regret to have it abolished, or diminished in the slightest degree. I believe it is their unanimous wish that it be continued. Athletics are not without their faults, but this is true, that besides promoting physical culture, they cultivate a college spirit among students, a disposition to stand up for one another and for their school. This spirit is manifested not only on the athletic field but at their homes in the various towns and neighborhoods of the state. It contributes to the well-known intense loyalty of our students and graduates to their college.

At the close of the first term Mr. J. B. Patterson resigned as Physical Director and one of the advanced class continued the work for less remuneration.

Near the beginning of the third term Mr. W. O. Trine was employed. Mr. Trine is one of the most successful trainers on the Coast and is a man of honor and integrity, qualities in which some coaches seem to be deficient.

I would ask that Mr. Trine be elected Physical Director with the same salary Mr. Patterson received, viz., $780.00. It is understood, however, that the Athletic Association will add $220.00 to this amount, making $1000.00 in all.

PRINTING OFFICE.

Our printing office is highly appreciated by Faculty and students. It turns out an immense amount of work during the year. Neatness, order and industry pervade the establishment. The traditional towel is not on exhibition. It is always a pleasure to show our printing office to visitors. But it is not a model office in every respect. We greatly need a modern cylinder press that will enable the printer to do the very best work such as the fine plate work that characterizes the bulletins of other stations.

GRADUATES.

At our Commencement, June 17, 1903, students, whose names with the titles of their theses, appear in the following list were graduated:—

HOUSEHOLD SCIENCE.

Second National Period of American Literature	Mabel Maud Abbe
The English Drama	Clauda Leolo Anderson
First Creative Period	Edith Jane Berthold
The Art of Window Gardening	Elsie May Canfield
First National Period of American Literature	Rosamond Leolene Chipman
The Victorian Age in English Literature	Sibyl Alice Cummings
Apples and their Preparation	Laura Lillian Chipman Beulah Bethsheba Harden
Systematic Housekeeping and the Art of Entertainment	Ada Eudora Finley Grace Whiteman
Table Decoration	Alice Odalite Horning
A Vegetable Autocrat	Lillian Johnson
Salt as a Preservative in Butter	Viola Ethel Johnson
The Household Preservation of Eggs	Ethel Elenor Linville Effie Laurie Michael
The Development of Chivalry During the Crusade	Emma Imogen Rusk
American Literature of the Revolutionary Period	Ida Mae Smith

AGRICULTURE.

The Origin and Development of the Horse	Claud Buchanan
A Study of the Noble Fir (abies nobilis)	Albert David Gerking
A Gravity Water System for the Oregon Agricultural College	John Edwin Johnson
Physical Characteristics of Western Hemlock and Douglas Fir	Minnie Grace Smith
A Study of the Insect Fauna of Alfalfa Fields	Elmer Gifford Wicklund

PHARMACY.

Chemical and Bacteriological Analysis of Water	Samuel Lewie Burnaugh Byram Mayfield
The Comparative Efficiency of Disinfectants	Walter Stanley Wells Lloyd Francis Millhollen

ELECTRICAL ENGINEERING.

Accumulators and Secondary Batteries	Edward Benjamin Beaty Joseph Paulson
The Magnetization of Iron	William Daniel Jamieson

Each of these was presented with a diploma and on each the degree of Bachelor of Science was conferred. Although this transaction accords with a resolution of the Board, I would ask that it be approved that a proper record may be made in the minutes.

Accompanying find report of the Director of the Station.

Respectfully submitted,

THOS. M. GATCH,

President of the Oregon Agricultural College and Experiment Station.

DEPARTMENT OF CHEMISTRY.

During the past year, the work of the Department of Chemistry and Pharmacy has been carried on as follows: During the Fall and Winter terms the Station Chemist devoted from two to four hours per day to College work. During the entire year, Instructor McKellips devoted all of of his time to College work in the Department of Pharmacy. Mr. H. D. Gibbs, who had charge of Assistant Professor Fulton's classes during the latter's absence at Harvard, devoted all of his time to College work in chemistry. Major F. E. Edwards devoted from two-thirds to three-fourths of his time to College work and from one-fourth to one-third of his time to chemical work in the Experiment Station Laboratory.

During the year there have been 31 classes and 18 laboratory sections in chemical and pharmaceutical subjects. This large number of classes and laboratory sections was due partly to the small size of the rooms available for the work. This difficulty so far as classes in chemistry are concerned, will be largely overcome when the Chemical Department becomes installed in its new quarters in Agricultural Hall.

Classes in mineralogy, geology and assaying will have commodious, well-lighted quarters, and will occupy the present Experiment Station chemical laboratory. The Pharmaceutical Department is the most cramped of any and if classes should increase much over their present size it would be a difficult matter to handle them. At the present time, the available laboratory space is so small that classes of from 10 to 15 students must be divided into two sections. This necessitates the instructor in Pharmacy, with only a small number of students, to put in double time upon the same subject. When this difficulty is removed the instructor will have considerable time to devote to other lines of work in chemistry.

The work of the Department of Chemistry and Pharmacy has progressed favorably during the year. Considerable apparatus and chemicals necessary for instruction and student use have been purchased. The students are abundantly supplied with chemicals and apparatus as compared to the number of reference books which are available for student use in the library. At the present time the weakest spot in the department is a lack of current periodicals, journals and reference books.

During the past year a laboratory course in soil physics was organized under the direction of the Chemist. This work consumed considerable time. For the coming year the work in soil physics will be given in one of the small chemical laboratory rooms, as this seems to be the only place available for the work. Considerable apparatus has been ordered for the class in soil physics, and this will be installed in the laboratory ready for use at the beginning of the next College year.

Considerable expense will be incurred in fitting up the chemical laboratories. One of the largest items will be the purchase of reagent bottles, which are absolutely necessary, and will cost probably $500.00.

The Chemical Department will be better prepared than ever before for the work of the coming College year. The general lecture room will accommodate 150 students. The general laboratory will have 96 student desks, each supplied with gas, water, sink, complete set of reagent bottles, drawers, cupboard, etc.

The quantitative laboratory will accommodate 24 students and has all the conveniences of a modern, up-to-date laboratory. A balance room and chemical library joins the quantitative laboratory. A laboratory which can easily be darkened is available for spectroscopic analysis. This room will accommodate probably 8 or 10 students.

If necessary, the soil physics laboratory can easily be arranged so that it can be used during the spring term for special work in gas analysis. This room will accommodate about 10 students.

In addition to the large chemical lecture room, one recitation room is available and will accommodate a class of about 25 students.

Classes in mineralogy, geology and assaying which have been shifting about from time to time and which have been cramped for space, will have permanent, well lighted quarters, and plenty of room in the present Station laboratory building.

With our new laboratories and increased facilities, the teaching in the Chemical Department will be made more interesting and instructive than formerly.

After having spent the past year at Harvard University, Professor John Fulton is with us again and has available the most modern thoughts along special lines in chemistry, geology and mineralogy.

Major Edwards expects to be absent on leave during the next College year, devoting his time to post graduate study. Otherwise

the personnel of the department will probably remain the same as during the past year.

Respectfully submitted,

A. L. KNISELY, Chemist.

REPORT OF THE DIRECTOR.

President T. M. Gatch:

DEAR SIR:—I have the honor to present herewith a synoptical report of the Agricultural Department of the Station for the year ending June 30, 1903, with the reports of the Station Chemist, Entomologist, Bacteriologist and acting Horticulturist.

It will be noted by these reports that new work has been undertaken in addition to the routine work of the Station and the continuance of work previously inaugurated. This new work is of scientific interest, as well as being of great economic value to the productive interests of the state.

The endeavors of the Station during the past year have mainly been directed along economic lines, thus dealing largely with problems more or less closely associated with the pecuniary interests of the agriculturist. However, I regret to say that the work of the Station has been somewhat embarrassed by the want of sufficient funds to satisfactorily cope with many new problems, presented as a result of the constant expansion and greater ramification of the agricultural industries of the state. Hence, in view of this rapid development of our agricultural interests and the increasing demand upon the Station for assistance, I respectfully suggest that the Hatch fund be supplemented with an amount commensurate with the importance of the problems involved. Despite this lack of sufficient means to adequately meet the agricultural exigencies constantly arising, it will be noted that much work has been accomplished by the Station during the year just closed. This result was attainable only through the intense unanimity of interest and the cooperative amity which characterizes the endeavors of the Station staff. This harmony of purpose among the staff in advancing the interest of scientific research is fortunate for the Station, as well as personally gratifying to the Director.

AGRICULTURAL DIVISION.

The work in this department consists chiefly of the same lines of endeavor reported last year. In field crops, the principal investigations are confined to the production of leguminous forage plants. Among these, alfalfa has occupied a prominent position. Different cultural methods have been employed in the growing of this plant, some of which have given satisfactory results. So far this plant gives indications of value for the well drained, heavy clay soils of Western Oregon.

The clovers, alfalfa and vetch are the principal leguminous forage plants receiving attention at this Station. With better and more general information among the farmers as to cultural methods for these plants, it is anticipated that the latter will meet nearly every requirement for an economical production of forage of this class.

Varietal tests of cereals and forage plants are continued along the lines suggested in the last annual report. This work is gradually assuming an economic feature of the Station rather than one of display.

Rotation systems of cropping, as referred to in last report, have been continued. In addition to the four acres set aside for more technical work, all of the Station farm, devoted to agriculture, is utilized to demonstrate the beneficial results of this system of farming.

COOPERATIVE WORK.

In addition to the cooperative efforts between this Station and a number of farmers for testing cereals and forage plants under varying conditions, the Station has continued its cooperative work in testing red clover seed with the Bureau of Plant Industry, also cooperative soil work with the Bureau of Chemistry of the National Department of Agriculture.

MISCELLANEOUS WORK.

Experiments in steaming silage, known as the "Oregon Method," are the most important of this type of work. The results of this work have been very satisfactory so far. The method is a marked improvement over the common systems employed. It not only increases palatability of the silage, but also prevents serious deterioration of its food value.

From the report of the Bacteriologist it is apparent that the milk from cows fed steamed silage is less acid than that from cows fed ordinary silage. From this we may infer that milk from cows fed steamed silage will have a higher value for condensing purposes, also possess better keeping qualities, than milk from cows fed on unsteamed silage.

The question of the practicability of the method for the general farmer and dairyman has been pretty conclusively demonstrated. The additional cost over putting up silage in the usual way is approximately 40 cents per ton for a 30-ton silo. For large silos the cost would be proportionately less. This includes labor and fuel exclusive of apparatus.

The work at Moro, Sherman County, will be discontinued after this season. It has been demonstrated that alfalfa and the field pea can be profitably grown on the wheat lands of the above territory. This largely solves the problem as to the feasibility of furnishing these soils with humus. At the close of this season a detailed tabulation of the results will be made.

Experiments with the use of nitrate of soda for cereal crops have been resumed.

ANIMAL HUSBANDRY.

The work in animal husbandry has mainly dealt with problems in fattening hogs, feeding dairy cows, sheep, and soiling both cows and swine. An appreciable increase in the annual yield of milk from the Station herd has occurred since the adoption of soiling instead of permitting the cows to run on pasture.

The soiling of hogs with alfalfa has not been satisfactory; which is apparently due to the tendency of the plant to rapidly develop woody substance, thus lessening its palatability. Rape and other tender, succulent forage gave satisfactory results.

An experimental feeding of silage to dairy cows and a fly repellent test, were conducted in co-operation with the Department of Dairying.

Experiments in feeding cattle were—

A. Experimental feeding of a Jersey cow for beef was undertaken to ascertain the cost of meat production in such an animal. The cow was a six-year-old pure-bred Jersey, a heavy milker, but withdrawn from the dairy owing to a pronounced predisposition to garget.

FEED CONSUMED BETWEEN WEIGHINGS—POUNDS.

	Mill Feed	Hay	Silage	Weight, lbs.	Gain	Loss
December 8, 1902				835		
15	29	56	175	870	35	
22	52	40	261	905	35	
29	63	33	307	945	40	
January 5, 1903	66	33	263	975	30	
12	69	43	231	958		17
19	70	48	226	985	10	
26	70	49	247	1010	25	
February 1	70	50	280	1020	10	
9	70	57	245	1030	10	
16	70	55	262	1050	20	
23	70	45	243	1060	10	
March 2	70	40	231	1078	18	
9	70	47	196	1090	12	
16	67	45	177	1090		
23	70	45	180	1100	10	
31	90	55	215	1100		
Total feed consumed	1066	741	3739			
Increase in live weight					265 pounds	

The mill feed consisted of one-half wheat bran, one-fourth each of linseed oil-cake meal and crushed wheat, by weight. The hay was mixed clover and grass. The silage was vetch, clover and corn, steamed.

It required for one pound increase in live weight 4.02 pounds of mill feed; 2.76 pounds hay and 14.11 pounds of silage.

FINANCIAL ACCOUNT.

Credit by 1100 pounds at 4 cents per pound		$44.00
Value of cow at beginning of Exp. 835 lbs. at 2¾ per lb.	$22.96	
533 pounds of bran at $15.00 per ton	3.99	
266½ pounds of oil meal at $30.00 per ton	3.99¾	
266½ pounds crushed wheat at $20.00 per ton	2.66½	
741 pounds of hay at $6.00 per ton	2.22	
3739 pounds of steamed silage at $2.50 per ton	4.46	$40.29¼
Net profit		$ 3.70¾

The value of the manure will easily offset the cost of labor. Thus it appears that the farmer is reasonably assured of a profit in an attempt to fatten such animals.

The butcher reported that the dressed carcass weighed 600 pounds, thus yielding 54 per cent dressed meat.

B. An experiment to determine if a dry cow could be maintained in good condition during the winter without concentrated feed.

A four-year-old dry Shorthorn cow, in excellent condition, was selected for the experiment. The hay fed was mixed clover and grass and the silage was clover, vetch and corn, steamed.

FEED CONSUMED BETWEEN WEIGHINGS—POUNDS.

	Silage	Hay	Weight. lbs.	Gain
January 1, 1903			1485	
February 1	620	435	1500	15
March 1	400	560	1500	
April 1	400	600	1510	10
Total feed consumed	1420	1595		
Increase in live weight				25 lbs.

Thus it will be noted that the cow was wintered very inexpensively.

C. An experiment with the "Calf Feeder" versus allowing them to drink from the bucket in the usual manner.

	With Bucket				Calf Feeder	
	Girl		Katherine		Rose	
	Weight	Gain	Weight	Gain	Weight	Gain
January 13, 1903	120		95		64	
19	125	5	95		75	11
26	130	5	110	15	85	10
Februa'y 2	140	10	110		90	5
9	147½	7½	127½	17½	100	10
16	160	12½	137½	10	112½	12½
23	185	25	155	17½	127½	15
March 2	173		155		133	5½
10	185		170	15	145	12
16	210	25	190	20	150	5
23	220	10	205	15	175	25
April 1	232½	12½	210	5	175	
7	242	9½	220	10	190	15
13	242		225	5	192	2
Increase in live weight—pounds		122		130		128
Per cent gain		101.6		136.8		200.

These calves were pure-bred Jerseys. Rose was one month younger than Katherine and about two months younger than Girl. They were fed 6 pounds of new milk morning and night with what mill feed and hay they would consume. Perhaps the feeder would show better results with skim milk.

Much speculation has been indulged in by stockmen as to the healthfulness of silage for sheep. To determine this a flock of 25 breeding ewes and one ram was selected. These sheep were in good condition at the beginning of the experiment, as their weight will indicate.

The sheep were fed all the steamed vetch and clover silage they would eat up cleanly, with about one-half pound of oats each per day.

Weight Dec. 15, 1902, 4645 pounds; Dec. 31, 4840 pounds; Jan. 31,

1903, 4767 pounds. They consumed during the 48 days, 8210 pounds of silage and 600 pounds of oats. Average amount of feed consumed daily per head, 6.58 pounds of silage and .48 pounds of oats.

With the exception of one animal the flock was apparently in the best of health at the close of the experiment.

Experiments in feeding swine were:—

A. Crushed wheat, versus whole wheat.

Ten, eight months old, graded Berkshire-Poland Chinas were divided as equally as practicable into two lots. Lot 1 was fed whole wheat and consumed 4.53 pounds for each pound of gain in live weight. Lot 2 consumed 4.42 pounds of crushed wheat for each pound of gain in live weight. Duration of fattening period, 61 days. The grain was fed dry, but clean drinking water was kept constantly within reach of the hogs.

B. To illustrate porcine individuality, a thrifty Ohio Improved, Chester White barrow, farrowed Feb. 17, 1902, was placed in a pen alone. The feed of this animal during the summer consisted of skim milk, rape, vetch, etc. Weight of pig at beginning of experimental feeding Nov. 1, 1902, 228 pounds. Weight at close of fattening period, Jan. 10, 1903, 412 pounds. Consumed in 70 days, 586.50 pounds of crushed wheat and 280 pounds of skim milk. Thus making a gain of one pound live weight from 3.19 pounds crushed wheat and 1.52 pounds of skim milk.

C. Soiling matured hogs.

May 1, 1903, two freshly weaned sows were placed with two other matured hogs in a pen provided with a small open yard. The four weighed, May 1, 1325 pounds. They consumed in the first period of 31 days 845 pounds of rape, 880 pounds of crimson clover, 412 pounds alfalfa, 14 pounds wheat screenings, and 20 pounds of oats. June 1 they weighed 1350 pounds. Thus they required 106.85 pounds of the green feed and 1.7 pounds of the grain mixture for each added pound of their live weight. From June 1 to July 1, they consumed 1642 pounds of alfalfa, and made a gain of 5 pounds. Hence they required 328.4 pounds of green alfalfa to produce one pound of live weight. Better results would, undoubtedly, have been obtained, had the hogs been pastured on the alfalfa. By the latter method, they would have fed on the tender shoots; while in soiling, by the time the plant attained sufficient height to cut advantageous-

ly, too much woody substance was developed to suit the palate of the hog. Suffice it to say that the hogs maintained a good, healthy condition during the whole time of the experiment.

D. Soiling young pigs.

May 1, 1903, sixteen pigs weighing 559 pounds were placed in a feeding pen with an open yard. From May 1 to June 2, they consumed 1693 pounds of crimson clover and alfalfa; 3504 pounds of skim milk; 75 pounds of crushed wheat. Weight June 2, 780 lbs. Gain, 221 pounds. Thus requiring 15.40 pounds of skim milk, 7.61 pounds of the green fodder and .34 pounds of crushed wheat for one pound gain in live weight.

E. An experiment to determine the value of a small supplementary grain ration in feeding green forage and milk.

June 2, the sixteen pigs used in Exp. D., were divided into two lots. Lot 1 weighed, June 2, 375 pounds. This lot consumed from June 2 to July 1, 502 pounds of alfalfa, 2308 pounds of skim milk. Weight, July 1, 505 pounds. Gain, 130 pounds. Thus they required 17.75 pounds of skim milk and 3.86 pounds of alfalfa for one pound increase in live weight.

Lot 2. Weighed, June 2, 405 pounds. This lot consumed from June 2 to July 1, 2055 pounds of skim milk, 456 pounds alfalfa and 112 pounds of crushed wheat. Weight, July 1, 530 pounds. Gain, 125 pounds. Thus they required 16.44 pounds of skim milk, 3.65 pounds alfalfa and .90 pounds crushed wheat for one pound increase in live weight.

The cost of producing a pound of live weight in Lot 2 exceeded that of Lot 1 by .55 cents per pound.

There was apparently no advantage obtained in feeding the supplementary grain ration except that Lot 2 presented a slightly better external appearance than Lot 1.

FARMERS' INSTITUTES.

There is a growing demand for more institutes. During the past year 20 institutes were held under the auspices of the Station with a total aggregate attendance of about 3750 persons.

In addition to this institute work members of the staff have attended and participated in the deliberations of a number of agricultural meetings and conventions.

Four bulletins have been issued by the Station during the past year.

Receipts from sales of stock, farm and dairy products for the year ending June 30, 1903, $1358.19.

Respectfully submitted,

JAMES WITHYCOMBE.

DEPARTMENT OF DAIRYING.

Corvallis, Oregon, June 30, 1903.

I submit herewith report of work in the Dairy section of the Agricultural Department for the fiscal year ending June 30, 1903.

During the first few days of the year attention was given to attendance upon a series of Farmers' Institutes held in the interior portion of the state. These meetings, together with one or two others held in the western portion of the state, consumed the greater portion of the month of July.

During the latter part of August an official seven-day milk and butter test was made of four Jersey cows owned by Mr. W. S. Ladd at his Crystal Springs farm. This was the first work of its kind to be conducted under the auspices of this Station, and it is expected that there will be frequent calls for this sort of work in the future.

The value of "Flyene" as a means of alleviating fly troubles with dairy cows has been tested to some extent. Beginning July 25 and continuing till Sept. 30, four cows were treated with this preparation and their weights at the beginning and close of the period compared with those of four other cows kept under similar conditions, except the fly-repellent treatment. The cows which were treated gained a total weight of 265 pounds during the two months while those not treated gained but 212 pounds during the same time. Two of the cows from each of these two lots, all having reached about the same stage of the lactation period, were compared as to yield of milk and butter fat. It was found that the cows under treatment shrank about 10 per cent less than the cows not treated, during the test period, the comparisons being made with the yields of the two months preceding. The following tables give detailed results:

YIELDS OF MILK AND BUTTER-FAT. FLY REPELLENT EXP. APPLIED JULY 25 TO SEPT. 30, 1902.

Name of Cow	June		July		August		September		Shrinkage June&Jul vs Aug&Sep			
									Pounds		Per Cent	
	Milk	Fat	Milk	Fat	Milk	Fat	Milk	Fat	Milk	Fat	Milk	Fat
Treated:												
Clara	414	18.63	346	16.61	324	15.71	333	14.32				
Lady Z	464	21.58	427	20.78	391	19.94	395	18.96				
	878	40.21	773	37.39	715	35.65	728	33.28	208	8.67	12.6	11.2
Untreated:												
Golden Alice	322	18.68	284	17.04	209	12.54	220	12.32				
Corvallis Rose	570	25.08	467	20.81	436	21.36	409	19.22				
	892	43.76	751	37.85	645	33.90	629	31.54	369	16.17	22.4	19.9

WEIGHTS OF COWS. FLY REPELLENT EXPERIMENT.

Name of Cow	July 25	Aug. 1	Sept. 1	Oct. 1		
Treated:						
Bessie	845	835	910	935	Dry Aug. 7, 1902	Calved Oct. 16, 1902
Corvallis Bouquet	860	875	922	955	" Aug. 8, 1902	" Oct. 3, 1902
Clara	850	850	875	910	" Jan. 23, 1903	" Mar. 25, 1903
Lady Z	795	790	805	815	Still in milk, July 15, 1903	
	3350			3615	Gain 265 lbs.	
Untreated:						
Corvallis Rose	820	890	880	895	Dry Oct. 27, 1902	Calved Jan. 1, 1903
Corvallis Beauty	815	890	870	920	" Aug. 24, 1902	Sold—not bred
Kate	1010	1030	1055	1012	" Aug. 15, 1902	Calved Nov. 1, 1902
Golden Alice	845	855	855	875	" Jan. 27, 1903	" Mar. 13, 1903
	3490			3702	Gain 212 lbs.	

The value of silage in maintaining the milk flow and body weight was tested to some extent. Nine cows were divided into three lots of three cows each. Lot I was given a full feed of silage. Lot II a half feed of silage, and Lot III received no silage.

The experiment was continued for eight weeks, beginning Feb. 3d. Lot I consumed during this time 1536 pounds of mill feed (equal parts by weight of bran and oil meal); 1582 pounds of mixed clover and grass hay, and 9812 pounds of clover and vetch silage. Lot II consumed of the same class of feed, 1484 pounds of grain, 2263 pounds of hay, and 5112 pounds of silage. Lot III consumed 1538 pounds of mill feed, 4098 pounds of hay, and 532 pounds of silage. The silage consumed by Lot III was fed during the first

few days of the experiment, in order that a too sudden change should not be made in the ration.

The decrease in weight, and the comparative yields of milk and butter fat are set forth in the following tables:

WEIGHTS OF COWS IN SILAGE FEEDING EXPERIMENT.

Name of Cow.	Jan. 1	Feb. 1	Mar. 1	April 1	Gain or Loss
	Lbs.	Lbs.	Lbs.	Lbs.	
Lot I, Silage—					
Topsy	925	900	905	835	
Francis	965	965	960	900	
Bessie	917	915	910	900	
		2780		2635	Loss, 145 pounds
Lot II, Half Silage—					
Girl	855	885	890	835	
Corvallis Bouquet	895	902	930	898	
Corvallis Rose	1000	865	910	855	
		2652		2588	Loss, 64 pounds
Lot III, No Silage—					
Maud	790	760	790	770	
Katherine	1050	1038	1015	992	
Kate	1020	1005	1000	987	
		2803		2749	Loss, 54 pounds

The average number of days the cows in each lot had been in milk when the feeding began was as follows: Lot 1, 85 days; Lot II, 81 days; Lot III, 78 days.

YIELDS OF MILK AND BUTTER FAT, SILAGE FEEDING EXPERIMENT.

Name of Cow	Dec. 4 to 31		January		February		March		Shrinkage			
									Pounds		Per cent	
	Milk	Fat	Milk	Fat	Milk	Fat	Milk	Fat	Milk	Fat	Milk	Fat
Lot I Silage:												
Topsy	979	44.06	1111	44.44	920	35.88	900	36.90				
Francis	812	38.98	1032	45.41	841	39.11	892	43.26				
Bessie	756	38·95	798	33.52	662	29.79	701	33.65				
	2547	121.99	2941	123.37	2423	104.78	2493	113.81	572	26.77	10.4	10.9
Lot II ½ Silage:												
Girl	570	29.05	613	27.59	510	23.21	538	26.90				
Corvallis Bouquet	473	21.76	478	23.42	392	18.82	401	20.45				
Corvallis Rose												
	1043	50.81	1091	51.01	902	42.03	939	47.35	293	12.44	13.2	12.2
Lot III No Silage:												
Maud	627	30.10	680	29.92	549	23.06	577	25.68				
Katherine	645	29.67	767	36.05	638	29.03	668	31.40				
Kate	644	31.56	698	32.11	573	25.78	630	27.72				
	1916	91.33	2145	98.08	1760	77.87	1875	84.80	425	26.74	10.5	14.1

To make the comparison periods of equal length only 28 days in December are considered.

The cow Corvallis Rose did not calve till about January 1, hence it was deemed best to use only two cows in Lot II for the comparison.

The work of installing the dairy apparatus in the new quarters in the Agricultural Hall practically prevented any experimental work in the dairy proper prior to Jan. 1, 1903. The plumbing and the setting of machinery in the cement floor fell almost entirely into the hands of the dairy instructor, which together with extra teaching in the College prevented him from carrying forward experimental work outside of the dairy.

Six cream separators of as many different makes were secured for use in the Special Dairy Course centinuing through the months of January and February. Careful daily tests were made of these machines, after the students became somewhat familiar with their operation, for the purpose of determining their efficiency as to rated capacity, thoroughness of separation, and quality of cream obtained. The results will appear in a bulletin soon to be published.

The increasing popularity of the hand cream separator makes a study of the questions connected with it of importance at the present time. A considerable number of tests have been made to determine to some extent the relations existing between the percentage of fat in the milk, its temperature, and the speed of the machine on the one hand, and the capacity, the thoroughness of separation, and the percentage of fat in the cream, on the other. This work will be continued until the results of a large number of such trials are available.

Probably the most valuable work in this section during the year has been that in connection with the Department of Bacteriology relative to the canning of cheese. About twenty separate and distinct lots of cheese have been made, for the most part in accordance with the usual Cheddar system followed by cheese factories, although a few lots were made after what is called the "stirred curd" process, and still others after the Swiss method. Nearly all the lots were inoculated with pure cultures by Professor Pernot. The results so far obtained indicate that flavor can be very largely controlled, and that the losses in curing, due to evaporation and formation of rind, can be practically eliminated. There are numerous problems in this connection which it is expected will be solved in the near future.

Weekly composite samples of all cows in the Station herd have been tested for butter fat and an accurate daily record kept of the milk yield. These individual cow records are now becoming valuable, having been continued for the past six years, formerly, however, with only monthly tests for fat content. Some very interesting points relative to the variation in fat content of the milk can be gathered from them.

The usual amount of testing samples for outside parties has been done this year. Numerous samples of cream and skim milk from hand separators have arrived through the mail. Several samples have also been tested for the Department of Chemistry.

Letters written to correspondents on dairy matters number about three hundred.

F. L. KENT,
Dairy Instructor.

DEPARTMENT OF CHEMISTRY.

In general the work of the year has been in many ways similar to that of the preceding year. The Chemical Department is interested in the following lines of investigation, some of which are being studied conjointly with other departments of the Experiment Station.

1 The study of steamed silage.
2 A study in crop rotations and their effects upon the soil.
3 The effects of summer fallow are being studied.
4 The conservation of moisture in the soil.
5 Hop drying—The effects of high and low temperature in the curing of hops.
6 The availability of plant food in the soil.
7 Acid soils in Oregon.
8 Studies in fruit drying—prunes and apples.
9 The effects of fertilizers on prune trees.
10 The amounts of plant food—especially potash in old apple orchard soils.
11 The use of lime in the straw heap. Does it hasten or retard the decomposition of the straw?
12 Feeding silage to cows. Does it effect the quality of the milk?
13 Protein in vetch hay.
14 Miscellaneous work.

I. STEAMED SILAGE.

The investigation with steamed silage which was carried on in small experimental silos the first year was enlarged considerably this last year when three of the large Station silos were piped and steamed. At the time of filling each of the large Station silos, samples were taken of the fresh material, and the sugar, acidity and moisture determined. A large sample was also taken, dried, and carefully put away for future analysis. Later in the year, when the silos were opened and the silage fed to the stock, a second series of samples was taken for analysis. Samples were taken each Monday from the silage as it was taken from the silo. The samples were put in air-tight jars and taken to the laboratory immediately. As soon as the samples were received, the acidity, sugar and moisture were determined. A large sample was also dried and put away

for future analysis. Care was taken to determine the sugar and acidity as soon as possible after the samples were taken from the silo before fermentation set in. By the foregoing method, we have carefully dried samples of the material as it went into the silo and also samples of the material as it came out of the silo. By comparing these samples we can ascertain the changes which have taken place in the large silos. At the present time complete fodder analyses are being made of these carefully dried samples.

Partial analyses giving the results for sugar and acidity in the steamed silage the past year are as follows:

STEAMED SILAGE.

Number of Silo	Date of filling Silo	Material and amount put in Silo	Length of time steamd	Dates of opening Silo and feeding silage	Waste on top of Silo	Per cent total reducing sugar and total acidity calculated as acetic acid.			
						When put in Silo		When taken out of Silo	
						Acid	Sugar	Acid	Sugar
Large Silo No. 1	June 30 to July 5, 1902	Cut Vetch 50885 lbs.	Hours 60	Jan. 15 to Mar. 30, 1903	2015 lbs	.27	2.07	.88	1.23
Large Silo No. 2	June 11 to June 12, 1902	Whole Clover 34160 lbs.	48	July 14 to Aug. 11, 1902	765 "	.18	1.36	.52	.93
Large Silo No. 3	June 12 to June 16, 1902	Cut Clover 72440 lbs.	80	Nov. 7 to Dec. 29, 1902	1600 "	.18	1.74	.71	1.21
Small Silo No. 5	June 21, 1902	Cut Clover 5854 lbs.	12	April 9 to April 14, 1903	785 "	.24	1.65	.42	2.08
Small Silo No. 1	June 26, 1902	Cut Clover 5380 lbs.	14	Mar. 31 to April 8, 1903	1000 "	.18	1.82	.44	1.84
Large Silo No. 2	Oct. 4, 1902	Cut Corn Fodder Frosted, 48600 lbs.	50	Dec. 31, '02 to Feb. 23, 1903	2350 "	.18	2.43	.48	2.15

ORDINARY SILAGE—NOT STEAMED.

Large Silo No. 2	June 1900	Whole Clover		Nov. 19, 1900 to Feb. 4, 1901				1.16	
Small Silo No 2	June 26, 1902	Cut clover 5335 lbs		Apr. 18 to Apr. 25, 1903	573 lbs.	.18	1.82	1.01	.75

In two silos the acid in the silage as it came from the silo averaged over one per cent. In neither of these cases was the material steamed. In all others the material was steamed and the amount of acid in the silage was considerably less than one per cent.

The steaming of the large silos was not entirely satisfactory. Too much time was apparently consumed in the operation. This perhaps was due to an excessive loss of steam which it is hoped will be obviated in future experiments.

Even though considerable steam was lost in steaming the material in the silos, the operation was quite beneficial and the steamed silage was much better than that which was not steamed. Stall-fed animals were able to eat, without the least injury, 50 to 75 pounds of this steamed silage per day.

An interesting experiment was tried by steaming a silo filled with frosted corn fodder. The immature corn was caught by an early frost and ordinarily it would have been ruined for feeding purposes. This fodder was cut immediately and put in a silo and steamed. This silage, when fed in the winter, was found to have suffered very little injury by the frost. The silo which contained the frosted corn fodder leaked air at the bottom as well as at the top, consequently considerable fermentation took place at the bottom. The changes which the corn fodder underwent are directly proportioned to the amounts of acid found in the silage. The weekly samples contained the following amount of acid calculated as acetic acid:

Date—1903	Number CC decinormal NaOH 100 grams corn silage neutraliz's	Per cent acid calculated as acetic
January 2	135	.81
" 5	80	.48
" 12	70	.42
" 19	50	.30
" 26	70	.42
Febru'y 2	60	.36
" 9	60	.36
" 16	60	.36
" 23	130	.78

The complete fodder analyses of this frosted corn as it went in and as it came out of the silo are as follows:

	When put in Silo No. 2429		When taken out of Silo	
	Fresh material Per cent	Dry material Per cent	Fresh material Per cent	Dry material Per cent
Moisture	78.76		80.93	
Dry material	21.24	100.00	19.07	100.00
Ash	1.40	6.57	1.18	6.18
Protein	1.78	8.37	1.51	7.94
Crude fiber	5.30	24.97	5.08	26.63
Nitrogen free extract	11 65	54.87	10.37	54.35
Fat	1.11	5.22	.93	4.90
Acid as acetic	.18	.85	.48	2.52
Total sugar	2.43	11.44	2.15	11.25

An examination of the above results shows that the material when taken from the silo compared very favorably with the material when it was put into the silo.

On Feb. 5, 1903, a sample of corn silage was obtained from the silo of Mr. M. S. Woodcock for the purpose of seeing how it would compare with the steamed silage. The analysis of Mr. Woodcock's silage is as follows:

	Fresh material	Dry material
	Per cent	Per cent
Moisture	78.98	
Dry material	21.02	100.00
Ash	1.99	9.47
Protein	1.73	8.25
Crude fiber	4.56	21 70
Nitrogen free extract	11.62	55.27
Fat	1.12	5.31
Acid as acetic	1.65	7.85
Total sugar	.49	2.33

By comparing this silage, which was put up in the ordinary way with the steamed silage, it is seen that it underwent considerably more chemical or biological changes than did the steamed silage, these changes being indicated by the large increase in acidity and decrease in sugar.

In pursuing the investigation of steamed silage, we have learned that corn fodder is much more easily and thoroughly steamed than other materials, such as clover or vetch. Bacteriological changes and the formation of acid are much more easily prevented in corn fodder than in cut clover or vetch.

During the present season it is the intention to make the bottom and side joints in each silo perfectly tight so that no steam will be wasted. This season the silos will be filled with cut corn and steamed. No steaming will be tried on clover or vetch.

II. CROP ROTATION.

In connection with the Agricultural Department, a series of crop rotations is being studied. The Chemical Department is especially interested in the effects of these different systems of rotation upon the chemical composition of the soil and also upon its texture or physical condition. This work has been under way three years and is to be continued for a number of years. Composite samples of the soil were taken before the investigation started, and each year since

that time, large samples of soil have been taken from each plat which receives a different system of rotation. These yearly samples of soil are indexed and carefully saved and will be analyzed and studied in order to note the effect of the different systems of crop rotation upon the soil.

III-IV. SUMMER FALLOW AND THE CONSERVATION OF MOISTURE IN THE SOIL.

Experimental work on summer fallow is being continued. Four experimental plats at Moro, Oregon, have been carried on for several years. These may be discontinued at the close of this season. The soil in these plats was sampled during the early part of the work. At the close of the experimental work, each plat will be sampled. The analyses will show the changes which have taken place in the plats due to different treatments. The rainfall at Moro is in the neighborhood of 10 inches so one of the main problems is how to best use this scanty amount of water.

During the present season, the moisture conditions of the different experimental plats at Moro are as follows:

Date 1903	Plate I Alfalfa Broadcast Per cent moisture	Plat II Alfalfa in Drills Per cent moisture	Plat III Bare Summer Fallow Per cent moisture	Plat IV Wheat Per cent moisture
May 1	9.70	10.48	10.55	11.14
8	6.73	7.47	9.28	9.97
15	6.51	6 44	10.26	10.23
22	5.74	6.44	9.88	9.63
29	6.00	5.53	10.67	9.72
June 5	4.90	4.71	8.34	7.60
12	4.70	4.63	8.36	6.99
19	5.49	7.03	9.62	8.50
26	4.51	4.76	9.55	7.22
July 3	5.26	4.32	9.12	6.06
10	5.12	3.96	7.77	5.58
17	4.92	3.99	8.44	4.36
24	4.23	3.49	7.62	4.76

An examination of this table will show that the amount of moisture in these plats is exceedingly small and at the present time three of these plats, I, II, and IV, have but little or no moisture available for plant growth. Plat III still contains considerable moisture available for plant growth. The soil at Moro is very light and sandy and therefore its moisture is quite readily available for plants. Plat III is in bare summer fallow this season—this conserves the moisture which will be of great help to the next crop, but at the same time it hastens oxidation and bacterial activity in

the soil and destroys the humus. As the humus is destroyed, the soil becomes more sandy and barren and has a tendency to drift. Oregon possesses some difficult soil problems.

V. HOP DRYING.

During the hop-picking season last fall, some experiments were started along the line of curing hops. Hops were dried at varying temperatures in order to ascertain the best temperature for artificially curing hops. Many of the hops in Oregon are dried at temperatures varying from 130 to 140 degrees and some dry at even higher temperatures. The Europeans do not dry at such high temperatures and some of them do not wish to exceed 100 or 104 degrees at most because the *Lupulin* and essential oils become much more volatile at higher temperatures. Even at ordinary temperatures the losses are appreciable, but as artificial heat is used, the greater the heat, the greater is the loss of the valuable portions of the hops.

In Oregon, hops must be dried quickly. This necessitates either high temperature or artificial draft. During the drying season several experiments were tried by creating artificial draft by means of steam jets placed in a funnel shaped arrangement made of galvanized iron. This was placed in the ventilating shaft of the hop kiln. The outlet for this forced draft was one foot in diameter. This opening for forced draft was entirely inadequate. The ventilating shaft of the hop kiln is 6 feet square and an anemometer placed in this shaft showed that, under natural conditions, without forced air current, 481,986 cubic feet of air passed up and out of the shaft in one hour. This was when the kiln seemed to be working at its best. These figures would have to be modified some because right in the center of the shaft the current is probably a little faster, while along the sides it would be considerably slower, due to friction.

In order to move this same volume of air through the galvanized iron exhaust pipe which was one foot in diameter, the air would have to pass through this pipe at the speed of 1.9 miles per minute. It is needless to say that the exhaust pipe used was entirely inadequate and not as efficient as the ordinary hop kiln ventilator. There is opportunity for work along the line of the more thorough ventilation of the hop kiln.

A number of samples of hops were obtained at different stages of

ripeness and preserved for future work. A study of the development of the *Lupulin* is under way. At the present time one of the senior students is collecting samples of hops and data for study during the winter.

VI-VII. ACID SOILS AND THE AVAILABILITY OF PLANT FOOD IN THE SOIL.

A number of data are on hand for bulletins on these subjects and will be gotten into shape for publication just as soon as time and pressing work will permit.

VIII. STUDIES IN FRUIT DRYING.

During the Fall, considerable experimental work was done in fruit drying. Two kinds of prunes were used—the Petite and Italian. Some drying experiments were carried on with apples and a few with potatoes. Many data have been collected on prune drying and these are reserved for bulletin work.

Some interesting work was done upon apples and potatoes—dipping them in solutions of salt water before drying and noting the effects upon the dried product. Apples and potatoes were pared and sliced, an apple-paring and slicing machine being used for most of the work. The slices varied probably from $\frac{1}{8}$ to 3-16 inch in thickness. Some lots of sliced apples and potatoes were dried without any further treatment; others were placed in dishes of cold water as they were sliced, and still others were dropped in dilute salt solutions varying from $\frac{1}{4}$ of one per cent up to 2 per cent. Sliced apples and potatoes, when exposed to the air, darken very rapidly, therefore some lots were immersed in cold water in order to keep them from the air until they could be placed in the dryer and quickly dried. Some samples were treated with salt solutions in order to see if this process would not give a dried product perfectly bleached without the use of sulphur. It was thought that possibly the dilute salt solutions would prevent oxidation on the surface of the fruit, or that there might be a slight chemical reaction between the salt and the fruit acids present which would liberate minute traces of chlorine. If such a chemical reaction took place, the liberated chlorine would act as a bleaching agent.

The results of this work are as follows:

Time when put in Dryer 1902	Number of tray	Kind of Treatment	Weight of apples put in dryer	Weight of apples taken out of dryer	* Loss of weight in drying	Time required for drying	Temperature at start	Temperature at finish	Remarks Concerning the Dried Product
			Lbs	Lbs	Per ct	hrs. min.	Fahr	Fahr	
Oct. 4, 10:25 a. m.	40	None	3.50	1 45	58.57	4 40	165	165	Rather dark tan color, similar to ordinary dried apples that have not been bleached
4, 11:07 a. m.	24	"	6.25	2.50	60.00	10 24	165	152	
4, 11:50 a. m.	14	"	3.75	1.00	73.34	5 40	165	164	
4, 12:20 p. m.	39	"	4.00	1.00	75.00	6 20	165	164	
Oct. 3, 7:30 p. m.	10	Dipped in ¼ per ct. salt solution	4.23	1.23	70.92	6 50	165	140	Considerably brighter and lighter in color than samples with no treatment
3, 7:50 p. m.	28	" "	4.50	1.00	77.78	7 40	165	140	
3, 8:10 p. m.	16	" "	4.75	1.25	73.68	7 10	165	140	
3, 8:30 p. m.	46	" "	6.00	1.50	74.00	6 50	164	140	
3, 8:50 p. m.	37	" "	6.25	1.25	80.00	6 35	163	140	
Oct. 3, 2:25 p. m.	8	Dipped in ½ per ct. salt solution	4.50	1.00	77.78	10 35	168	138	Very bright and white
3, 3:05 p. m.	23	" "	5.00	1.25	75.00	10 00	166	138	
3, 3:55 p. m.	47	" "	4.25	1.25	70.51	9 10	163	138	
3, 4:45 p. m.	22	" "	3.75	1.00	73.34	8 20	163	138	
3, 5:50 p. m.	27	" "	4.00	1.00	75.00	8 30	165	140	
Oct. 3, 9:15 p. m.	33	Dipped in 1 per ct. salt solution	5.00	.50	90.00	6 10	162	140	
4, 12:55 a. m.	36	" "	4.00	.50	87.50	12 00	137	166	
4, 1:40 a. m.	7	" "	4.00	1.25	68.75	12 10	139	166	
4, 2:15 a. m.	32	" "	3.50	1.00	71.43	13 10	140	164	
3, 11:20 a. m.	49	Dipped in 2 per ct. salt solution	5 50	1.00	81.82	3 50	160	166	
3, 12:00 m.	9	" "	5.00	.75	85.00	6 35	155	165	
3, 12:50 p. m.	31	" "	4.75	.75	84.21	10 25	162	145	
3, 1:17 p. m.	35	" "	4.75	.75	84.21	11 38	163	137	
3, 1:40 p. m.	18	" "	4.75	1.00	78.95	11 20	167	138	
Oct. 4, 12:50 p. m.	4	Dipped in cold water	5.00	1.75	65.00	7 00	166	158	Somewhat lighter than no treatment but much darker than salt treatment
4, 1:10 p. m.	48	" "	5.00	1.50	70.00	9 50	166	150	
4, 1:50 p. m.	3	" "	2.50	.50	80.00	6 50	167	153	
4, 2:30 p. m.	25	" "	3.00	.25	91.67	7 00	166	152	

EXPERIMENTS WITH SLICED POTATOES.

Sept. 30, 3:57 p. m.	16	No treatment	5.75	1.20	79.14	5 13	145	133	Badly colored some very dark; most of the lot were of a grey color
Sept. 30, 5:25 p. m.	46	Dipped in cold water	6.00	1.00	83.34	3 50	148	133	Color not uniform—some nearly white, others dark grey; a few nearly black
Sept. 30, 10:00 p. m.	10	Dipped in ¼ per ct. salt solution	5.23	1.00	80.88	6 00	135	155	Much lighter in color than the lots receiving no treatment or cold water treatment
Oct. 1, 1:30 a. m.	6	Dipped in ½ per ct. salt solution	5.50	1.25	77.27	6 00	131	158	Very nearly white
Oct. 1, 2:30 a. m.	16	Dipped in 1 per ct. salt solution	4.00	1.00	75.00	5 30	135	160	White and perfectly bleached
1, 3:40 a. m.	28	Dipped in 2 per ct. salt solution	3.50	1.00	71.43	5 00	150	164	

* In these experiments the per cent loss of weight sustained in drying is larger than usual, due to the fact that the samples were dipped in water or dilute salt solution.

From the amount of work done it would seem that slicing into a one per cent salt solution gave results as satisfactory as any.

Apples and potatoes dried in the foregoing way were put in paper sacks and left in a damp building for some months. The dried apples absorbed much moisture and had to be taken to a dry building, while the potatoes did not have a tendency to absorb moisture and remained dry and brittle. After ten months exposure to air and light the apples are gradually darkening in color while the potatoes seem to keep their original white color. These potatoes would probably stand any climatic conditions, as they do not seem to absorb moisture, mold, or ferment. When soaked in cold water a few hours, eight to ten, or over night, they resemble freshly sliced raw potatoes and cook very nearly as well as the fresh article.

The experiment was tried of making Saratoga chips by cooking the dried potatoes without previously soaking them and a failure was the result. The cooked article tasted exactly like burned roasted peanuts. When the dried potatoes were first soaked in cold water for eight or ten hours and then cooked in hot lard, a very good quality of Saratoga chip was the result. Potatoes cut in narrow strips and dried, when soaked up make an excellent French fried potato.

Potatoes dried in this way are probably more bulky than potato meal, but they surely look better and make more tempting dishes when cooked. More work will be done on potatoes this summer.

IX-X—THE EFFECTS OF FERTILIZERS ON PRUNE TREES AND THE STUDY OF POTASH IN ORCHARD SOILS.

This is the third consecutive season that fertilizers have been applied to a five acre prune orchard. Up to the present season no apparent effect has been noticed, but it is about time for the trees to show the effects of the fertilizers which have been applied to them in different combinations. A study upon the plant food in old apple orchard soils is being pursued at the present time.

XI. USE OF LIME IN THE STRAW HEAP.

On Sept. 26, 1902, two piles of wheat straw were made on the College farm. One pile contained 1135 lbs. of straw with one barrel of quicklime mixed through it. The second pile contained 1055 lbs. of straw with no treatment. Both of these piles have been exposed to the weather. Samples from the straw piles have not yet

been analyzed. When these analyses are made they will show the effects of the lime on the straw.

XII. FEEDING SILAGE TO COWS.

When condensed milk factories are established in a community, the question of feeding silage to cows is sure to be raised. Some parties insist that the feeding of silage has an injurious effect upon the milk which is used for condensing purposes. This objection was raised in the Eastern states some years ago, but as the making and feeding of silage became better understood, the objection was withdrawn.

Oregon is beginning to establish condensed milk factories and this silage feeding question is being raised. Experimental work bearing upon the above subject was carried on during the winter. A number of samples of milk were received at the chemical laboratory for analysis; part of the samples were from silage-fed cows, others from hay-fed cows. The results of the analyses are as follows:

Date.	Composite Sample of Milk from—	Specific Gravity.	Total Solids.	Fat.	Total Protein.	Casein.	Albumin.	Nitrogenous matter other than casein or albumins. Albumose, etc.	Milk Sugar.	Ash.	Acidity: Deci-normal NaOH required to neutralize 100 cc of milk.	Acidity: calculated as Lactic acid.
1903		15° C.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	cc.	Per cent.
Feb. 20	Three hay-fed cows	1.0375	13.27	4.15	3.34	2.72	40	22	5.00	.740	15.0	.130
23	" " "	1.0310	13.79	4.85	3.44	2.60	.41	.43	4.30	.723	11.0	.096
27	" " "	1.0315	13.68	4.65	3.38	2.64	.39	.35	4.50	.793	11.5	.100
Mar. 2	" " "	1.0345	12.47	3.20	3.47	2.54	.47	.46	4.60		12.5	.108
	Average	1.0338	13.30	4.21	3.41	2.62	.42	.37	4 60	.752	12.5	.108
Feb. 20	Three silo-fed cows	1.0370	13.36	4.30	3.21	2.59	.36	.26	5.05	.513	11.5	.099
23	" " "	1.0340	12.99	3.50	3 25	2.60	.36	.29	4.95	.669	12 0	.104
27	" " "	1.0340	13.35	3.80	3.42	2.80	.37	.25	4.85	.593	11.5	.100
Mar. 2	" " "	1.0340	13.58	3.90	3.38	2.55	.44	.39	5.10		13.5	.117
	Average	1.0347	13.32	3.87	3.31	2.63	.38	.30	4 99	.592	12.1	.105
	M. S. Woodcock's cows fed											
Feb. 26	very sour silage	1.0340	12.65	3 75	3.17	2.50	.38	.29	4.50	.750	17.5	.152
Mar. 3	" " "	1.0350	13.48	4.20	3.26	2.56	.43	.27	5.30	.714	17 0	.148
5	" " "	1.0326	12.50	3.40	3.38	2.60	.45	.33	4.95		14.0	.122
10	" " "	1.0370	11.98	2.75	3.13	2.50	.41	.22	4.70	.770	15.0	.130
12	" " "	1.0350	13.04	3.85	3.06	2.50	.30	.26	5.00	.740	16.0	.139
17	" " "	1.0340	13.01	3.75	3.00	2.38	.33	.29	5.05	.670	14.0	.122
24	" " "	1.0330	12.37	3.90	2.66	2.14	.32	.20	4.60	.710	15.5	.135
26	" " "	1.0350	12.85	3.90	2.93	2.41	.36	.16	5.00	.690	13.5	.117
April 2	" " "	1.0340	12.35	3.35	2.85	2.34	.29	.22	4.90	.720	15.0	.130
	Average	1.0344	12.69	3.65	3.05	2.44	.36	.25	4.89	.640	15.3	.133

The foregoing analyses do not vary from one another any more than the analyses of milk coming from cows receiving the best hay and mill feed.

The amount of acid found is slightly higher than is usually found in fresh milk. This is due probably to the fact that the milk stood from three to five hours after it was drawn before the acid was determined. It is supposed that milk as it comes from the udder contains no acid but that fermentation and the formation of acid starts immediately. The higher per cent of acid in the milk coming from the cows of Mr. Woodcock may or may not have been due to the silage fed. Only one distinct feature could be clearly noted in the different samples of milk. The sample coming from the silage-fed cows had a more pronounced odor than did the milk coming from the hay-fed cows; although the odor was more marked it was not at all disagreeable. This important feature of the work, namely, of estimating and analyzing the gases given off the milk was not carried out owing to a lack of the proper apparatus.

From the chemical analyses which have been made, we do not feel justified in the least in condemning the intelligent feeding of silage to cows whose milk is to be used in condensed milk factories.

XIII. PROTEIN IN VETCH HAY.

In the feeding of farm animals one of the most important as well as the most expensive materials to obtain is protein. Leguminous plants which thrive luxuriantly in Western Oregon, are richer in protein than other classes of plants and it is believed that by proper selection the per cent of protein ordinarily found in these plants, can be increased considerably. Common vetch (*Vicia sativa*) is one of the most promising legumes of Western Oregon. This plant is very easily grown and was therefore selected for some experimental work. Vetch hay, dry, usually contains from 12 to 16 per cent protein. Now, the question is, can this per cent of protein be increased by selection.

If the individual plants vary much from each other in composition, this fact would lend encouragement to the work which is planned. As preliminary work, a number of individual vetch plants were selected, each of which were at the proper stage of ripeness for hay, that is, when the lower pods were well formed but before the seed began to develope. The amount of protein found in a single stalk from each plant is as follows:

ANALYSES OF DRY MATERIAL.

Single stalk from vetch plant	No.	1,	14.63	per cent	protein
" " "		2,	15.88	"	"
" " "		3,	16.31	"	"
" " "		4,	16.38	"	"
" " "		5,	16.38	"	"
" " "		6,	17.87	"	"
" " "		7,	18.31	"	"
" " "		8,	18.41	"	"
" " "		9,	18.41	"	"
" " "		10,	21.31	"	"

These results show that there is a wide variation in the per cent of protein in vetch and it is believed that by careful, systematic selection, the vetch plant can be improved and made more valuable for feeding purposes. It would cost no more to produce vetch hay containing 20 per cent or more of protein than it does to produce hay containing 12 to 16 per cent. Careful study and work will be given to this line of investigation for some years.

XIV. MISCELLANEOUS WORK.

Aside from the routine Station work and special lines of investigation, there is a vast amount of time and labor spent in doing miscellaneous work. This includes analyses of fodders and feeding stuffs, soils, waters, and odds and ends in general.

Some work was done for the State Dairy and Food Commissioner but the amount of work done for him has decreased considerably since the appointment of a Deputy Food Commissioner, who is a chemist, and who does most of the analytical work for the Commissioner.

During the winter, several samples of a prepared cattle food were sent to the Station for analysis. This was said to be made in Portland and was sold as a substitute for bran but was supposed to be better and cost more per ton than bran. A composite sample of this food was analyzed and the results compared with wheat bran are as follows:

	Prepared Cattle Food No. 2519		Wheat Bran	
	Fresh Sample	Dry Sample	Fresh Sample	Dry Sample
	Per Cent	Per Cent	Per Cent	Per Cent
Moisture	9.50		11.90	
Dry material	90.50	100.00	88.10	100.00
Ash	5.13	5.67	5.80	6.60
Protein (NX 6.25)	8.25	9 11	15.40	17.40
Crude fiber	18.65	20.61	9.00	10.20
Nitrogen free extract	53.77	59.42	53.90	61.30
Fat	4.70	5.19	4.00	4.50

These results show that the prepared cattle food contains twice as much crude fiber and only about half as much protein as wheat bran and is therefore not nearly so valuable as bran, even though it is sold at a higher price.

A sample of cocoanut-oil-cake meal was received from a party in Portland. This substance can be imported in quite large quantities from the Orient and can be sold for about $30 per ton as cattle food, if desirable as such. The analysis of this cocoanut meal is as follows:

	Fresh Sample	Dry Sample
	Per Cent	Per Cent
Moisture	14.51	
Dry material	85.49	100.00
Ash	5.47	6.40
Protein (NX 6.25)	18.62	21.78
Crude fiber	4.19	4.90
Nitrogen free extract	44.67	52.25
Fat	12.54	14.67

This analysis would indicate that this cocoanut meal is worth considerable more than bran as stock food.

A sample of bunch grass (*Agropyrum divergens*) was obtained at the Eastern Oregon Experiment Station, at Union, for analysis. This sample was collected this spring and was quite badly bleached but was thought to be a good sample for the time of year at which it was taken. The analysis is as follows:

	Fresh Sample	Dry Sample
	Per Cent	Per Cent
Moisture	9.07	
Dry material	90.93	100.00
Ash	7.68	8.45
Protein (NX 6.25)	2.39	2.63
Crude fiber	22.03	24.23
Nitrogen free extract	54.87	60.34
Fat	3.96	4.35

This analysis hardly comes up to expectations. Fresh samples were gathered during the early part of August by Mr. John Howard, of Prinville. These samples arrived at the Experiment Station, Aug. 14, 1903. Their analyses are as follows:

	Dry Sample No. 1	Dry Sample No. 2
	Per Cent	Per Cent
Dry material	100.00	100.00
Ash	16.62	18.40
Protein (NX 6.25)	10.60	7.82
Crude fiber	24.57	25.78
Nitrogen free extract	43.66	44.11
Fat	4.55	3.89

Analysis shows that the sample of bunch grass which had been exposed to the winter storms had lost most of its protein and about one-half of its mineral constituents and was not worth much as food, whilst the analyses of the fresh samples compare most favorably with those of the best cultivated grasses. The per cent of ash in bunch grass is exceptionally high. Quadruple determinations were made of the mineral constituents.

A sample of vetch seed, (*Vicia sativa*) grown at the Experiment Station, had the following composition, which is compared with European analyses:

			Average of European analyses compiled by Dietrich and Koenig. Futtermittel Vol. I.	
	Fresh Sample	Dry Sample	Fresh Sample	Dry Sample
	Per Cent	Per Cent	Per Cent	Per Cent
Moisture	13.03		13.28	
Dry material	86.97	100.00	86.72	100.00
Ash	2.87	3.30	3.23	3.72
Protein (NX 6.25)	26.04	29.94	25.90	29.87
Crude fiber	2.84	3.26	6.02	6.94
Nitrogen free extract	54.12	62.23	49.80	57.43
Fat	1.10	1.27	1.77	2.04

Partial analyses of insecticides were made as follows:

		Arsenious oxide As_2O_3	Cupric oxide CuO
		Per cent	Per cent
No. 2367	Paris green from Medford, Oregon	47.60	29.98
2368	London purple from Medford, Oregon	20.58	
2376	Paris green from Albany, Oregon	46.85	24.66
2552	White arsenic from Hood River, Oregon	95.52	

Six samples from Oregon salt deposits were examined:

		Sodium chloride	Calcium sulphate	Magnesium compounds	Insoluble residue
		Per cent			
No. 2378	Monmouth	99.34			
2379	Monmouth	100.00			
2345	Silver Lake	75.00	Considerable		
2346	Silver Lake	68.00	Considerable	Considerable	
2445	Silver Lake	96.20		.47	.08
2547	Silver Lake	97.93	Traces		

Examinations of soils were made as follows:

		Analyses based on dry soils					Acid Soluble			
		Humus	Total Nitrogen N	Total Phos. acid P_2O_5	Potash K_2O Total per cent.	Potash K_2O Acid Soluble	Lime CaO	Iron Fe_2O_3	Alumina Al_2O_3	Magnesia MgO
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
No. 2382	Klamath Marsh	.....	.12	.08	1.02	.....	.....	.....	.....	.....
2383	Corrall Springs	.....	.16	.15	.96	.....	.....	.....	.....	.....
2407	Canby prune orchard—sandy loam	.....	.28	.23	.....	.12	.36	.....	.....	.....
2410	Marshfield—Coos River bottom-land	.....	.11	.17	.....	.15	.24	.....	.....	.....
2425	Central Point—subsoil	.....	.03	.11	.....	.06	14.36	.....	.....	.....
2448	Hood River—sandy loam	.....	.06	.21	.....	.19	.40	.....	.....	.....
2449	Hood River—sandy loam	.....	.08	.24	.....	.18	.33	.....	.....	.....
2450	Hood River—sandy loam	.....	.07	.20	.....	.22	.41	.....	.....	.....
2540	La Grande—surface soil "sand ridge"	1.12	.08	.25	1.74	.26	1.50	3.82	3.61	.64
2541	La Grande—below hardpan "sand ridge"	.96	.06	.39	1.44	.26	5.63	7.39	5.12	2.19
2542	La Grande—alkaline salt grass land	.78	.03	.36	1.52	.37	1.25	6.72	5.40	.86

Analyses of the following clays were made:

		Silica SiO_2	Alumina Al_2O_3	Combined water and organic matter	Potash K_2O	Lime CaO	Magnesia MgO	Iron Fe_2O_3	Moisture. Hygroscopic H_2O
		Per ct	Per ct	Per ct	Per ct	Per ct	Per ct	Per ct	Per ct
No. 2457	1 Yamhill County	58.54	20.65	7.12	.54	.50	.93	6.31	6.10
2457	2 " "	60.08	11.99	7.44	1.50	3.48	.23	3.65	12.76
2457	3 " "	58.17	14.78	6.61	1.08	2.44	.67	6.64	10.13
2457	4 " "	64.54	19 52	4.32	2.19	2.22	2.26	1.66	1.19
2457	5 " "	51.00	17.00	6 45	1.56	2.30	2.63	7.30	10.99
2453	Clatsop County	69.98	18.02	5.30	.69	1.02	.16	3.98	2.60

A few partial analyses of fertilizing materials were made:

	Nitrogen N Per cent	Phos. Acid P_2O_5 Total Per ct.	Phos. Acid P_2O_5 Soluble Per ct.	Potash K_2O Per ct.
No 2375—Phosphate from Lamberson's Sons, Portland	.....	43.68	35.15	.....
No 2387—Complete fertilizer, D. R. McDonald, The Dalles	2.78	19.75	.....	.17
No 2388— " " " "	2.37	6.40	.....	10.78
No 2395—Dry wood ashes from Lamberson's Sons, Portland	.....	3.23	.....	1.55
No 2396—Damp " " " " "	.....	3.00	.....	.78
No 2404—Tankage from Lamberson's Sons, Portland	7.55	16.50	.....	.42
No 2465—Nitrate of soda from Portland Seed Co	11.05	.....	.....	.....
No 2473—Complete fertilizer, Lamberson's Sons, Portland	1.90	11.00	.....	6.64

Under the heading of routine Station work, many examinations and partial analyses were made which are not mentioned in this report. During the past year the Station Chemist has had one

assistant, Major F. E. Edwards, who devoted from one-fourth to one-third of his time to Station work. Aside from this one assistant, the Chemist has had all the work to do.

The Chemist believes that more work would be done and better results accomplished if one assistant could be appointed whose duty it would be to devote his whole time to Experiment Station chemical work. Under the present management, the College work crowds so much, that during the College year the assistants in the Chemical Department devote practically all their time to College and none to Station work. During the summer months, the Chemist is able to devote all his time to Experiment Station work. During the Fall and Winter terms of College, the Chemist spends from two to four hours per day to College work. During late Fall and and early Winter, considerable time was consumed by institute work. In the Winter term a series of twenty lectures on topics in agricultural chemistry was given to the students of the Farmers' Short Course.

During the Winter one nature study leaflet, "The Story of the Air We Breathe" was written.

At the present writing, the Chemist has material and data on hand so that bulletins can be prepared on the following subjects:

I. Availability of plant food in the soil (technical).
II. Plant food and the use of fertilizers (popular).
III. Occurrence of acid soils in Oregon.
IV. Studies in fruit drying.

These will be gotten into shape for publication just as soon as pressing work and time will permit.

Respectfully submitted,
A. L. KNISELY, Chemist.

DEPARTMENT OF ENTOMOLOGY.

The work of the department, as in past years, has consisted largely of the accumulation of data relating to injurious insects and plant-diseases, and methods of repressing them; and may be itemized as consisting of studies of life-histories, experimental work with insecticides and fungicides, the preparation and preservation of illustrative material, the determination of insect pests and plant diseases for correspondents, the taking of numerous photographs with which to illustrate future bulletins, and taking notes for record. I have also attended the usual number of farmer's institutes and horticultural meetings.

From the nature of the case, much of the work is fragmentary and cannot well be summarized in a report. It becomes of value only when taken in connection with the work of other years and when enough notes have accumulated on some particular subject to justify their presentation in the form of a bulletin.

Considerable attention has been given during the year to the curl-leaf of the Italian prune, in continuation of work that has been under way for the past three years. During that time cooperative work has been carried on in the orchard of Mr. B. W. Johnson; observations have been made in other orchards in this vicinity; and in September and October, last, I visited several of the principal prune-growing regions of the State and obtained considerable information regarding the conditions under which curl-leaf occurs. In the laboratory a somewhat elaborate series of experiments were carried out to determine, if possible, the relation of moisture supply and transpiration to the disease. In connection with the chemist some studies of soil moisture were undertaken which supplemented, and so far as they went, verified the work done in this laboratory. Should curl-leaf prevail this season it is hoped to gather enough supplementary facts to justify presenting the results of the work in the form of a bulletin.

Apple scab is the most troublesome pest with which apple growers have to contend in western Oregon. For the past eight or ten

years the college orchard has been sprayed with varying success each year merely as a part of the necessary horticultural operations, but little or no attempt has been made to accumulate accurate data regarding the value of the practice owing to the belief that no additional experimental evidence is necessary to demonstrate the great value of the very common practice of spraying with Bordeaux for this disease in early spring.

However, so many complaints have reached me from growers who have failed to get satisfactory results that a series of experiments to be conducted under orchard conditions was planned and is now being carried out in a cooperative way in the orchard of Mr. John Meeker. This orchard which consists of about 400 trees of Newton Pippin, a variety exceedingly susceptible to scab, is conveniently located and is furthermore desirable for these experiments by reason of the fact that it has been sadly neglected in the past. Present indications are that the results obtained will be exceedingly satisfactory.

In cooperation with the Department of Agriculture I am also conducting a series of experiments to test the effect of different amounts of free arsenious acid in Paris green upon the foliage of apple, pear, prune and peach trees.

Respectfully,

A. B. CORDLEY.

DEPARTMENT OF BACTERIOLOGY.

I herewith submit a report of work done in my department, during the year ending June 30, 1903.

One of the most important features of my year's work, has been the discovery of a practical method of curing cheese in tin cans hermetically sealed, and controlling its flavor. This problem has been a difficult one, long sought for, and the results thus far have been very gratifying. The experiments conducted were upon original lines, and the success which has been attained, marks a new era in the dairy industry.

Briefly described, the process consists in inoculating fresh milk with pure cultures of selected organisms. These, acting as starters, produce the necessary acidity, after which rennet is added and the curd made in the usual way as for cheddar cheese. After the curd is in a condition for the press, it is packed into tin cans of various sizes, which have previously been coated with paraffine inside, to protect it from the tin. A loose band of tin about two inches wide is provided, so as to insure a full can after it has been pressed. The can and band are filled with curd, which is pressed with an instrument similar to a potato masher, while the can is filling; they are then covered with a circular block and placed in the cheese press, to remain over night under fair pressure. After removing the block and loose band, the lids are placed on and soldered, hermetically sealing the curd. Ripening goes on in the can as rapidly as with cheese in the curing room.

Upon opening the can, the structure of the cheese is found to be different than that which is made in the ordinary manner, inasmuch as the canned cheese, instead of being tough and waxy, is friable, delicate and tender, dissolving in the mouth with but slight mastication, mixing readily with the saliva, and is very digestible, a quality much to be desired.

There is no evaporation in curing cheese by this method; a pound of curd makes a pound of cheese. There is no rind and no mould, consequently no waste of the original amount of curd.

Up to the present time, seven pure cultures have been experimented with, producing distinctly different flavors, and there still remains broad possibilities for variation.

Before sealing the cans, plate cultures were made from the curd and a record kept of all the organisms found.

When the cans were opened at different stages of ripening, plate cultures were made from the cheese and a record kept of the organisms found. By this means those which survived canning and are probably instrumental in controlling the flavor, were studied.

In the plate cultures which were made before sealing the curd, the organisms used to innoculate with, were found to predominate in excess, in fact, the plates usually contained but from one to three other organisms in small numbers.

Cans have been opened at regular intervals and so far it seems that the ripening, after it reaches a certain stage, ceases, and the cheese does not become excessively strong, as is the case with the ordinary article.

A full report of the organisms used and found in the curd at the time of canning, and when the cans were opened, would be too voluminous, suffice it to state that the experiment thus far, has given very satisfactory results. When sufficient data is obtained, a bulletin will be issued, descriptive of the process.

BACTERIAL ANALYSIS OF MILK FROM SILAGE FED COWS.

Some of the condensed milk concerns, having refused to accept milk from cows which had been fed with silage, an investigation was desired. In compliance with your request, an extensive qualitative bacterial study was made to determine, if possible, a cause for rejecting such milk.

In making this investigation, a cow was selected from our Station herd, to which was fed a diet of sweet silage, 55 lbs, hay 9 lbs, mill feed 9 lbs; another was selected to which was fed hay 25 lbs, mill feed 9 lbs, and a third one was selected from a neighboring dairy, to which was fed sour silage 40 lbs, hay 9 lbs, bran 9 lbs, shorts 3 lbs, oil meal 2 lbs, daily.

From each of these cows 50 c.c. of milk was drawn by the use of a pipette inserted in the teat. The pipette was connected with a small flask by passing through a cotton plug, and the projecting end was covered with a thick layer of cotton, tied in several places. Before taking the sample of milk these flasks and pipettes were

sterilized in a hot air chamber, a sample of middle milk was then obtained, by placing the cotton covered pipette to the end of the teat, and by pressure, forcing the pipette from its covering, into the milk duct of the teat; 50 c.c. of milk were thus obtained asceptically from the udder. Upon removing the pipette, the cotton covering was at the same time replaced to its former position, excluding air from the milk.

Another sample was taken in sterile flasks, from mixed milk in the pail, which had been exposed to the air of the stable during the time of milking.

These samples were secured twice a week from each cow mentioned, and plate cultures were made immediately upon receiving them at the laboratory, by flowing the milk on solidified agar, in pasteur dishes. The plates were incubated for forty-eight hours, and then agar slants were made from the different colonies. Gelatine, potatoes and litmus milk, were inoculated from these, then smear preparations and hanging drops for the microscope, completed the investigation. A classification and record was kept of the cultural characteristics of each organism found. As the number of cultures and subcultures made, reached such an enormous number, space will not permit of a detailed description of them.

The following summary shows the total number of different organisms found, which produced an acid reaction in litmus milk, and also those which did not. The acid forming organisms exceeded in number in the sour silage milk, the sweet silage milk having the least of all.

The term sweet silage in this case, is applied to corn silage which had been heated by steam when placed in the silo to preserve it. This material so treated, carries a smaller amount of acid, and less acid forming organisms, than silage prepared in the usual manner.

SWEET SILAGE, UDDER MILK.

Number of colonies which coagulated litmus milk, with acid reaction 4
Number of colonies which did not coagulate milk 7

SWEET SILAGE, PAIL MILK.

Number of colonies which coagulated litmus milk, with acid reaction 12
Number of colonies which did not coagulate milk 7

HAY, UDDER MILK.

Number of colonies which coagulated litmus milk, with acid reaction 8
Number of colonies which did not coagulate milk 6

HAY, PAIL MILK.

Number of colonies which coagulated litmus milk, with acid reaction 13
Number of colonies which did not coagulate milk 2

SOUR SILAGE, UDDER MILK.

Number of colonies which coagulated litmus milk, with acid reaction 19
Number of colonies which did not coagulate milk 7

SOUR SILAGE, PAIL MILK.

Number of colonies which coagulated litmus milk, with acid reaction 26
Number of colonies which did not coagulate milk 11

Many samples of the udder milk contained no organisms at all, especially milk from the hay fed cows.

In sterilizing separator skimmed milk from silage fed cows, for culture purposes, it was found that heating caused an acid reaction to take place, and the milk also turned a light brownish yellow color, unsuiting it for culture media. It was then found necessary to sterilize by the intermittant method, at a much lower temperature. The physiological and chemical reaction of the acid forming organisms on silage fed milk, may, when it is heated, be responsible for this, and be the cause of its rejection for condensing purposes.

There can be but little doubt, that the excretions from the enormous number of organisms in common silage, has an influence upon the milk. Although the germs do not pass from the food to the milk through the mammary glands, their chemical products do.

The biochemical study of milk, from cows fed with different materials, would probably give more conclusive data than a bacterial one.

TREATING SEED WHEAT TO PREVENT SMUT.

Testing the injurious effects of treating seed wheat by different methods to prevent smut, was continued this year. Four lots of wheat, containing 100 kernels each, were soaked in the following solutions for four hours. After being allowed to dry, they were planted in plats, with each kernel six inches apart.

No. 1. Copper sulfate ..... 1 lbs.
Water ..... 5 gals.
No. 2. Copper sulfate ..... 2 lbs.
Water ..... 5 gals.
No. 3. Formaldehyde ..... 1 lb.
Water ..... 50 gals.
No. 4. Formaldehyde ..... 2 lbs.
Water ..... 50 gals.
No. 5. Seed heated to 150 degrees F. dry heat, for one half hour.
No. 6. Seed untreated.

On July 8, the number of plants, and number of heads formed, were counted in each plat.

No. 1.	Total number of plants	17
	Total number of heads	207
No. 2.	Total number of plants	38
	Total number of heads	481
No. 3.	Total number of plants	24
	Total number of heads	295
No. 4.	Total number of plants	25
	Total number of heads	412
No. 5.	Total number of plants	69
	Total number of heads	545
No. 6.	Total number of plants	67
	Total number of heads	585

The conditions of plat No. 1, being situated near the fence, were not so favorable as the others.

Strong fungicides are no doubt a detriment to seed grain, especially vitriol, which soaks into the soil in the immediate vicinity of the young plant, either destroying or injuring it, so as to prevent full stooling. This accounts for the large amount of seed necessary to produce a good stand of grain.

The hot air treatment has been all that could be desired in preventing smut on wheat or oats, and the high percentage of seed which germinates, commends its adoption.

The usual number of specimens sent to the laboratory, of diseased animals and fowls, all received proper attention.

Respectfully submitted,

E. F. PERNOT.

DEPARTMENT OF HORTICULTURE AND OLERICULTURE.

I have the honor to submit the following report on horticulture for the years 1902-1903.

During the greater part of the year I have had temporary charge of the experimental orchards. The orchards have had great attention in the way of cultivation and care of fruit. The end of the first week in January the work was taken out of my hands and remained so until the end of February when I was asked by the Director to resume charge of the work. The work has gone on through the rest of the year without any interruption whatever.

During the first part of the year the work consisted of caring for small fruits in the way of taking notes on time of maturity and harvesting the same, and putting them on the market, although we have not much demand for such in our home market, but the endeavor was to make as much out of the product as possible.

The orchards were kept well cultivated and put into good condition and the hop gardens also have been well taken care of. As the small fruit matured samples were preserved in fruit jars for exhibition purposes at the State Fair.

All varieties of apples and pears have been taken care of as they matured and stored away in fruit room. During the early spring all trees received an extra pruning which was very much needed. All trees were relabeled. This had become necessary as many of the numbers had been lost and obliterated.

There have been grafted onto three-year old Mahaleb cherry stock two hundred and ninety-one of the standard varieties of cherry, namely, Lambert, Johnson's Seedling, Royal Ann, Elton, May Duke, Neapolian Bigarreau and Late Duke; also grafted onto quince stock. The following pears: Fifty Doyenne, 73 Bartlett, 30 Winter Nellis. Twenty-six varieties of apples have been top-grafted on to the young trees at the extreme west of the orchard. These scions were received from the British Columbia Experiment Station. The varieties of apples received from the Department of Agriculture were used in the same manner as above.

There have been one dozen each of the most promising varieties of plums of the European varieties perpetuated, also a number of peach plum and other promising varieties.

One row of two-year old Ben Davis stocks was grafted with two varieties of native crab apples received from Dr. Withycombe, and one row with Baldwin apples, scions received from E. R. Lake, coming from the orchard of C. Buchannan, three rows of Steel's Red and one row with Cox's Golden Pippin, scions received from a Mr. Frances, London, England.

During the year 1903 a great quantity of cherry and plum seeds were sown in garden for the purpose of trying to raise stocks for working next year. A quantity of Japanese plum seeds were sown. These were received from the Department of Agriculture.

All varieties of small fruits have been cared for in the way of pruning and cultivating. The blackberrfes have received a new trellis.

There have been added by purchase eighteen varieties of newly introduced strawberries and several untried novelties have been donated to the Station for the purpose of determining the value of each. All varieties are making a vigorous growth at the present time and some are very promising.

The hops were changed from the string system of training during the winter and poles placed in each hill. The yard has been put into a good state of cultivation and the young vines tied to the poles, when needed. In fact, attention has been given them at all times, whenever necessary during the growing season. I see no reason why we should not have good results the coming season.

On the 28th of February there were seven varieties of peas sown in the vegetable garden, one of spinach of recent introduction and supposed to be of great merit. Eight varieties of onions were planted, the plants having been raised in boxes, seed sown in greenhouse January 22d, consisting of the following varieties: Nameless, from Burpee, Improved Yellow Globe and White Spanish from Department of Agriculture, Ailsa Craig, own seed, originally from Sutton & Son, England; Large Red Weatherfield, Burpee Silver Skin; Australian Brown and Yellow Globe, O. A. C. seed.

Two varieties of tomatoes, corn beans and cabbage have been planted in garden as an experiment to test the value of three different commercial fertilizers on the growth of the plants. It is the intention to experiment in spraying for the prevention of tomato rot,

which has become very troublesome the last few years. We hope to work out a remedy this season that will be of benefit to growers.

Last season the Station received a small sample of cattle sugar beet seed from Attlee Burpee & Co. which produced some very fine appearing specimens. These have been set out for the purpose of raising seed this season.

During the summer of 1902 seed of a number of varieties of peas, beans—broad or horse bean—onions, corn, cabbage, sprouting Broccoli, Japan vetch, Late Broccoli, savoy and lettuce were saved and distributed in small lots to those who wished them.

In addition to above cuttings of currants, gooseberry, quince, Myrobolan plum, strawberry and raspberry plants, and scions of different varieties of apples, pears and cherries were set out for trial. There have been two hundred cuttings of Logan berries placed in the nursery ground for the purpose of determining the feasibility of raising them from cuttings of matured vines. The general method has been to propagate from the tips of the plants. These are very apt to die out during the dry season. If they can be propagated from cuttings stronger plants may be had for planting and a better result may be had. Some work has already been done in a small way with fairly good results. This season will demonstrate the practicability of this method.

Owing to the frequent inquiries as to the best methods of the cultivation of rhubarb, arrangements are being made to carry on varied experiments in the cultivation of same, also best and cheapest methods of forcing the plant.

The work of taking notes on the data of bloom of the varieties of orchard fruits has been entrusted to Mr. W. T. Johnson.

Very respecttully submitted,

GEORGE COOTE,
Acting Horticulturist.

REPORTS OF STANDING COMMITTEES.

REPORT OF STATION COMMITTEE.

CORVALLIS, OREGON, JULY 15, 1903.

To the Board of Regents of the Oregon Agricultural College.

Gentlemen:—Your committee on Experiment Station makes this, its Annual Report.

The year ending June 30th, has been an active and prosperous one.

FARMERS' INSTITUTES.

There have been held by the Station faculty during the year, 20 Farmers' Institutes. The attendance upon and interest in these meetings are constantly increasing and there is a constantly increasing demand for the holding of these Institutes in all parts of the state. The interchange of ideas made possible by these meetings, between the producing farmer and the Station staff, is resulting in much advantage to the farm industry.

We believe the time has come when the State can with propriety and profit undertake the expense of Farmers' Institutes in the State, thereby leaving the appropriation by the General Government to be used in carrying on agricultural experiments as designed by Congress. The expenses of Farmers' Institutes for the past year have been $363 for traveling expenses, for time and printing about $1,000.00.

ALFALFA.

There is now growing on the Station grounds, an alfalfa field four years old, which this year is bearing a fine crop. The climate of Western Oregon is well adapted for the growth of alfalfa. When the soil is open and porous and well drained we shall be able to produce alfalfa in the Willamette Valley.

By a feeding experiment it has been determined that breeding hogs can be maintained upon alfalfa without other food.

CHEESE.

Professor Pernot, Station Bacteriologist, has by some investiga-

tions, been able to can cheese, and control its flavor as desired. This is a very valuable discovery. In this production there is no rind, no mould, no evaporation.

SWEET SILAGE.

This year the sweet silage process was tried with large silos and it is a good success with corn. It looks like sweet silage fed milk could be used at the condensed milk canneries.

FRUIT AND VEGETABLE CANNING.

We have an abundance of material in this State for fruit and vegetable canning. The promotion of this industry should be taken up by the College and Station.

DAIRYING.

The Station herd is steadily advancing in excellence and the dairy industry is becoming very large in the State. There is every indication that it will remain permanently prosperous. The Station is giving a great deal of aid to this production.

HOP CURING.

Some experiments have been made in the curing of hops at lower temperatures that have heretofore been used.

BENTON KILLIN,
J. M. CHURCH, } Com.